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THE IRON TRADE REVIEW

Vol. LXVI Cleveland, January 1, 1920 *No. 1*

One Year of Reconstruction

BY C. J. STARK

ONE year of peace finds the world still swept by the demoralizing currents created by war, and set free with the subsiding of patriotic ardor and military discipline. Events which in normal times would have been regarded almost calamitous for trade and industry have been crowded into the past year. Europe measured by her depreciated exchange is commercially insolvent. Organized labor radical in its autocracy has sponsored acts and demands bordering upon the revolutionary. Dangerous and fanciful doctrines looking to the upheaval of orderly society have been common to all countries. Commodity prices have continued their unbroken advance until they have borne heavily upon domestic life. A passion for reckless spending has seized upon all peoples. Deep unrest has been widespread.

Yet, critical as conditions may have become, the worst has been escaped. While the future undoubtedly will require infinite courage, patience and the application of absolute justice, the supreme test has been met. The moral fibre of the world has stood firm against a baptism of discord and delusion. The first great convulsion is over and reason is returning.

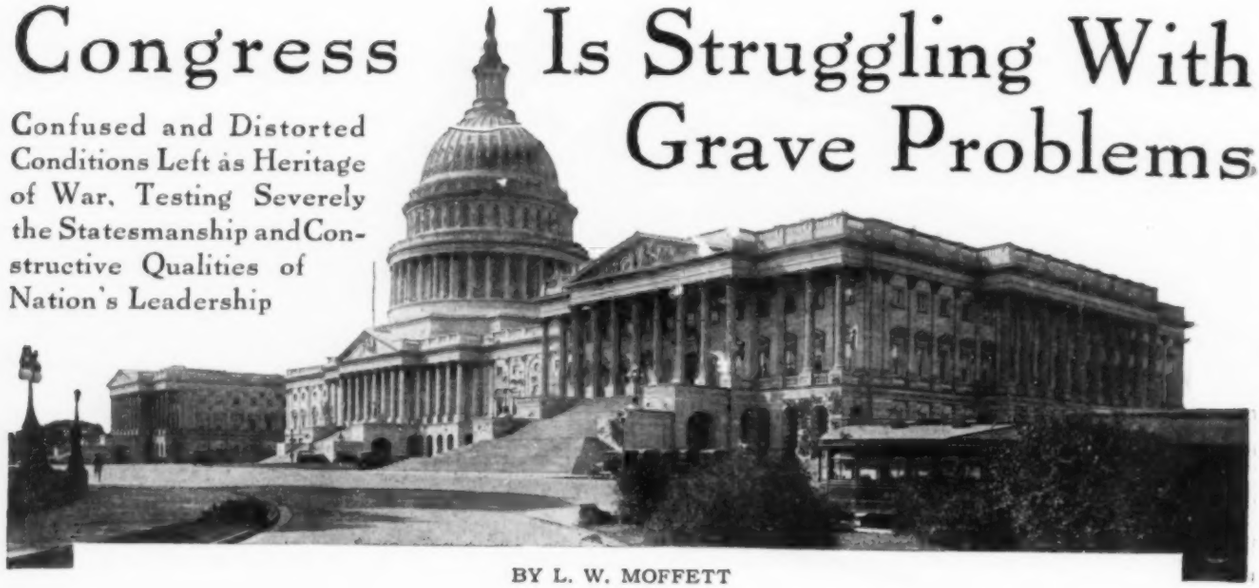
Of the European nations facing the great problems of reconstruction, Belgium most sorely tried of all, appears to have made the most progress toward restoring her normal industrial life. Though her production measured by her iron and steel industry is but a pitiful fraction of her prewar strength, it has been ample to reveal clearly that the heart of her people remains resolute and sound. France has set herself to her task but scarcely with the application and tenacity that have characterized the efforts of Belgium. Her accomplishments of the year are much less impressive. Great Britain's record of the year is frankly disappointing. This is ascribed largely to the high-handed course pursued by British unionism. Production has suffered greatly as a result of the nation-wide unsettlement. The overshadowing question in Great Britain's economic life is the re-establishment of her position of exchange and hence her former foreign trade. The exact status of German industry at this time is in doubt owing to the conflicting reports. In the main it may be said that her people are taking up with their habitual submissiveness the heavy burdens which peace has imposed upon them.

For the United States the first year of reconstruction, has fallen below expectations gaged by business standards. With the whole world looking to this country to fill its urgent wants after four years of under-supply and with a tremendous accumulation of domestic demand, the outlook has appeared promising. But the restoration of confidence has failed to bring the expected results. Production by a wide margin, has not met the possibilities of the situation and has been far below capacity. The chief cause may be laid to labor disturbances and to labor inefficiency. The year's record of strikes and lost output is appalling.

The world has not yet taken to itself broadly the one sure and permanent cure for its economic ills—work and produce. The experiences of 1919 have been marked by disappointment, by failure and by hopes unfulfilled. Yet together they have constituted an important stage in the process of complete recuperation. They have served to reveal the unsound and the fantastic among the convulsive movements of a transformed age. Thereby they have speeded the final return of composure and of sobriety. This gradual recovery of moral poise supplemented by underlying economic forces ceaselessly working out natural readjustments arising from the excesses of common life today, give 1920 a definite message of hope and promise which 1919 never possessed.

Congress Is Struggling With Grave Problems

Confused and Distorted Conditions Left as Heritage of War, Testing Severely the Statesmanship and Constructive Qualities of Nation's Leadership



BY L. W. MOFFETT

OUT of the world war discontent has grown throughout the universe. Complaint in peaceful and violent form is made of social conditions, of economic conditions, and of political conditions. Talk of revolutionary movements is heard and attempts in that direction are being made. Distrust is entertained toward both the political parties and with all politicians. As Dr. Henry Van Dyke, former American minister to the Netherlands, has said, "The world may be more sober, but it certainly is not more sane." Pressure of human passion and impulse has become more intense, while restraint of reason and conscience has relaxed.

These symptoms have been declared to be the natural result of the war. History is repeating itself. A nation, we are told, never comes out of a war as it went into it. It comes out nervous and querulous. The reaction is due in large part to the lack of concrete purpose, making an absence of visualization, in direct contrast to the well-defined unity of purpose so well and remarkably displayed during the conflict, when the object was to win the war at any and all costs necessary. Were it possible to galvanize that spirit of the people into action today in an effort to reconstruct orderly conditions, the multiplicity of problems overhanging the nation at present could be solved within a short time. But that is impossible, so that in putting a "new motif in the American drama," the country may as well make up its mind to go through serious trials, with dislocation of industry, of economics and of social conditions.

Framing of a program of progress and common sense is proving a slow and difficult undertaking. Every conceivable malicious doctrine is preached and the anarchist, including the I. W. W., the soviet advocate, and numerous other varieties of "reds" are seeking to make the most of the occasion, to overthrow the government and switch to chaos and destruction. Quack schemes and quack advice are disseminated profusely by aliens on our shore and from abroad. Thrust into international affairs more than ever as a consequence of the war, the United States is sought as the spawning ground for wierd and ruinous ideas that first amuse and then arouse the true American, whose tolerance sometimes seems to know no bounds. Even ordinarily conservative men, becoming inoculated with either a part or all of these nostrums, absorbed the more easily because of the agitated state of the human mind, disclaim, threaten and demand a new order of things out of all proportion to reason and without regard to the welfare of the nation.

Still, the republic lives. It will continue to live. The ship of state will pass through the storms of strife and stress and come into harbor intact and even of keel. The stability of the United States, it may be said with pardonable pride, is the keystone in the arch of world safety. Conditions in the future will be changed in many respects from and will never return to those of prewar days. Nevertheless, they will be built upon a base of orderliness, without wreck or chaos, and will not be forced by hysteria, or threat, or through fright caused by the vociferous but relatively few vicious radicals. The foundation of the government and its superstructure will remain the same as they always have been, but some new furnishings will be apparent perhaps, most of them desirable, even if in places there is a piece which is somewhat out of taste. The United States and the world will regain any sanity it has lost.

The unscrambling of eggs which became mixed during the war when the government either dominated or entirely controlled the resources of the country has begun. The government is entering upon new relations with the world and is seeking at home to restore normality to business and industry, to turn back those functions taken from the latter, and to close that wide breach between capital and labor, so far as possible, a mighty task indeed.

To ascertain the tendency toward this effort, it is necessary primarily

Legislation Needed

President Wilson's Message to Congress, Dec. 2, 1919

A budget system.

Simplification of taxation.

An adequate wage for labor.

A reasonable return for capital.

Prison for advocates of violence.

New economic policy toward Europe.

A "genuine democratization of industry."

Protection of dye and chemical industries.

A tribunal for adjusting disputes between capital and labor.

The principles of the league of nations as the only "sure way to industrial peace and conciliation."

to look to the trend of legislation as expressed by congress. While the problems are gigantic, and clamorous and numerous demands are shouted at the legislative doors, it may be said in passing that congress for the most part is proceeding in a fairly satisfactory manner, if rather slowly, and showing a spirit that ultimately will bring about sound conditions. This applies equally as well to the executive branch, for it is a co-ordinate branch of the government and each must work with the other finally, despite any sharp differences that may intervene. It is not intended to convey the impression that everything done and being done meets with the approval of the whole country, but largely the fundamentals as being worked out in this period of reconstruction are sound. With the regular session of congress convened, it is hoped to make more progress than was accomplished at the recent special session whose legislative work was restricted by reason of the prolonged discussion in the senate over the league of nations and the peace treaty. Work done and outlined by

REPRESENTATIVE JOSEPH W. FORDNEY
Chairman Committee on Ways and Means

the congress at the special session was, after all, greater than it has been credited with.

To get back to a strict basis of peace, the outstanding matters which involve legislation relate to such subjects as labor, tariff, merchant marine, finance, taxation, restoration of additional elements of commerce to private ownership, immigration, naturalization and Americanization, and vocational rehabilitation of persons disabled in industry and their return to civil employment. The attempt here shall be only to show the tendency of legislation as it bears upon these and other questions.

Taking up the problem of labor, there plainly is a notable change in the attitude of congress and the administration. Or, put in another way, labor, as represented by organizations, has sought such unreasonable demands that they have been repellent to both congress and the executive branch. In the clashes that have come between the government and organized labor, the latter has been worsted, as has been the case uniformly in the past. Granting that organized labor has acquired concessions wholly unjustified, the government has not yielded its principles, which it was virtually told it must do.

Neither private capital nor the government has tried in the least to deprive labor of any of its rights. On the contrary, it has been granted increased wages by both and its conditions of work improved further. But, probably spoiled by favors it gained through pressure, both before and during the war, it has cried for the moon, heedless of the riches around it which have been so liberally bestowed. The radical element, some of them avowed "reds," undoubtedly have been an important factor in emboldening labor to attempt exaction of demands that are out of all consideration. Leaders of organized labor, apparently fearing the imaginary, oncoming dominance of the radicals and feeling that in order to hold their positions they must likewise become radical, have resorted to words of defiance against private industry and the government itself. Those who have done the most for them have not escaped their bitter attacks.

Expressions of this sort by organized labor are too fresh in the minds of the people to call for detailed enumeration. Consequently, some of the more illuminating examples only will be mentioned. The steel strike situation is one of them. So entirely stripped of justification finally was the strike, and so vicious was its leadership that not only the public generally, but the majority of congress was strongly out of sympathy with it and it was openly denounced by many members of that body. The senate committee on education and labor, some of whose members have been strong supporters of organized labor, investigated the strike and, not satisfied with attacking the radicals who led it, said "the American Federation of Labor has made a serious mistake and has lost much favorable public opinion which otherwise it would possess by permitting the leadership to pass into the hands of some who heretofore have entertained most radical and dangerous doctrines." Thus on this occasion organized labor lost sympathy which it hoped to obtain at the hands of congress.

SENATOR BOIES B. PENROSE
Chairman Finance Committee

This strike, like the coal miners' strike and the incipient strike last summer of railroad shopmen, were only part of a vast campaign by organized labor to dictate to industry through the closed shop. Public welfare was flouted, but President Wilson in the case of the railroad shopmen brought their attention to this important fact and was successful in his order that they return to work, although late in November they were offered concessions as to hours of labor and pay for overtime by the railroad administration. The President's attitude and that of congress against the striking policemen of Boston formed a factor in settling that dispute, although the most important element in accomplishing this was the steadfast position of the authorities of that city and of the state of Massachusetts.

President Gompers of the American Federation of Labor, and other agents of that organization have for years strutted through the halls of congress and told that body if it passed

certain labor laws labor would not obey them. Dramatic tales of impending calamity if "labor is shackled" were told and are being told. Likewise, the railroad brotherhoods have failed to intimidate congress into adoption of the vicious Plum plan. The hostility of congress engendered by this demand was all the more marked when it is recalled how these same brotherhoods forced the administration and congress to enact the Adamson law.

Cumulative evidences of organized labor to attempt to jam through its own program finally made congress realize that it would have to take a more firm stand than it has taken in the past. Many will concede that its stand has not been as firm as it should be, but at least it represents a hopeful sign. The house bill to return the railroads to private owners passed with much weaker provisions to handle the labor situation than it contained originally, showing the influence of organized labor, but even as it passed it met with the opposition of union officials. The measure as approved by the house only provided for voluntary conciliation, which practically means nothing. It even went so far in its compromise as to provide that the wage level cannot be altered without labor's consent. In its original form the measure went no further than to provide a plan for co-operation in the adjustment of disputes through committees or groups of employes representing unions on

SENATOR WILLIAM KENYON
Chairman Committee on Education and Labor

SENATOR ALBERT B. CUMMINS
Chairman Committee on Interstate Commerce

one hand and the carriers on the other, both in the adjustment board and in the board of appeals and for fining unions for violating contracts. In contrast to this, the senate committee on interstate commerce reported out its railroad bill with an antistrike bill, which caused organized labor to violently protest and threaten. It has been thought from the outset by many members of congress that if antistrike legislation were to be taken up it should be done through a separate measure.

Sentiment also has grown against class legislation in favor of labor. This position has not gained the desired strength, but has accumulated more force. This is denoted by the resolution of Senator Edge, of New Jersey, to repeal the exemption clause in the deficiency bill, whose funds at present cannot be used to prosecute labor organizations.

Not content, however, with bringing force from within the United States, organized labor, through Mr. Gompers, was successful in having labor clauses inserted in the peace treaty. These clauses, however, would have been nullified even if the original treaty had been ratified because of a reservation offered by Senator McCumber, of North Dakota, and which had been adopted by the senate. By these labor clauses all countries parties to the treaty could intermeddle in determining labor conditions of each other and the ill-feeling this would arouse was denoted by the farcical international labor conference held in Washington under the provisions of the treaty where the United States had no official representatives because it had not ratified the treaty. Working of these labor clauses would have an extremely distasteful form of internationalism, and particularly so for a country like the United States.

People of entirely different living and working standards, of all kinds of creeds and faiths, some of them radicals of the worst sort, would be allowed to have a voice, and perhaps a dominating voice, in labor conditions in the United States as to wages, hours of work, etc. Some members of the senate who stood ready to approve the labor clauses merely in an effort to insure ratification of the treaty were really opposed to them. There were other members of the senate, known as vigorous supporters of organized labor, who strongly opposed the clauses. Despite the fact that the clauses were sponsored by Mr. Gompers, they contended that it would be extremely disadvantageous to labor, and this has led to speculation as to why organized labor wanted them adopted. The answer to this by some senators at least is that these clauses looked to the establishment universally of the closed shop, to be followed with still more radical plans. Organized labor, it has been claimed, sought through these clauses to establish a government within the government of the United States, the inner government holding international relations with the inner governments of other countries.

"What a commentary on the prohibition in our Constitution against the sovereign states of the union from having any foreign relation with other governments," exclaimed former Speaker Cannon in referring to these labor clauses.

Changed Attitude on Tariff

Congress also has shown a changed attitude toward the tariff. It has become a lesser element as a partisan issue, and is held to be a partial reflection of the growing nonpartisanship of the people generally. Senator Penrose, chairman of the committee on finance, known as a high protectionist, has said that there is to be no revision of the tariff for some time, exactly as President Wilson has said, but that when the period of commercial adjustment shall have expired the Republican party in congress will restore protection for American industries and American labor. The senator agreed with the declaration that had been made previously

by Alba B. Johnson, former president of the Baldwin Locomotive Works, to the effect that downward revision of the tariff is essential if the United States is to become a real factor in world trade. Senator Penrose, however, takes the position that the principal nations of Europe are not in such a bad way financially and economically as consideration solely of their war debts would indicate. He referred to the extensive acquisition of valuable economic territories gained by them through the war. Chairman Fordney, of the house committee on ways and means, has been holding out for a high protective tariff, but appears to have yielded his views in part for the present. He has insisted, however, upon substantial duties in the special tariff acts that the house has passed, such as those concerning magnesite, tungsten, zinc, etc. It is generally recognized by Senator Penrose and others that the nations of Europe cannot carry on trade with the United States unless they have commodities to send to this country in exchange for articles and commodities imported by them from the United States. These countries, members of congress explain, cannot continue to pour their gold into the United States with all the gold in the world being cornered here, leading to the ultimate stoppage of all foreign purchases in this country. With foreign nations in this peculiar position, it is pointed out, it is the general consensus of opinion among business men all over the United States that it is not practical or even desirable to begin general tariff revision in the immediate future. In the meantime, congress has much to occupy it in making a complete study of conditions relative to the tariff that it may be prepared at the right moment to enact legislation. The free port bill is being considered as a new form of legislation in connection with the tariff for this country and many members of congress are giving it closer study so as to become more familiar with it.

Must Have Merchant Marine

On nothing is congress more determined than that the United States shall have a merchant marine, and whatever may be the fate of the new fleet, congress is insistent that it shall be privately owned and privately operated. The public generally has become thoroughly surfeited with government control, not only with relation to telephone and telegraph lines, which have been returned, and with the railroads, but also with other instrumentalities, although such con-

REPRESENTATIVE ALBERT JOHNSON
Chairman Committee on Immigration

trol was favored as a necessity of war. The house and senate bills differ in some respects, but both provide for private ownership and operation, with the shipping board remaining as a regulatory power after disposing of its vessels.

With the United States becoming a creditor nation the development of foreign markets and foreign investments is increasingly important and therefore finance is one of the essentials involved. The world wants to buy and borrow from this country in amounts never even imagined before and which run into the billions of dollars. The single source of supply of money and various kinds of goods for the world is the United States. The Edge act, which passed congress at the special session, would permit the formation of foreign finance corporations with a minimum capital of $2,000,000 under the federal reserve act to advance credits up to 10 times their capital and has been endorsed generally by banking and other business interests, although criticised by some because of what are termed restrictions of power.

A complete budget system will be provided for the financial administration of the government by the bill of Representative Good, chairman of the house committee on appropriations, which has passed the lower branch of congress, and a bill by Senator McCormick, chairman of the senate special budget committee. The principal difference in the two measures is that the senate bill calls for an executive form of budget in which the secretary of the treasury has full control over the annual estimates of expense that are submitted by the 10 major executive departments, while the house bill places the budget bureau in the office of the President. Both are aimed toward budgetary reform, keeping a check on the expenditures of the government departments and placing them on a business-like basis. Supporters of this legislation look upon it as an important item in reducing taxes and therefore as of vital interest to the business world. Up to 1917 the total expenditures of the government from the foundation of the United States was $25,000,000,000. Since the beginning of the war, congress has appropriated $51,500,000,000. Indications are that the annual cost of administration in the years ahead will not be less than one-sixth of the total cost of the government from the foundation of this nation to the time it entered the war.

This money will have to come direct from the people. Indirect taxes of large amounts no longer are present. The tax on liquor, which formerly paid half the cost of government, disappeared with prohibition and even high tariff proponents admit that the tariff cannot provide more than $500,000,000 a year, as against the expenditure of $6,000,000,000 last year. Unless there is another bond issue, the individual income tax and the corporation tax are to be the chief

REPRESENTATIVE JOHN J. ESCH
Chairman Committee on Interstate and Foreign Commerce

sources of the revenue. This will center public attention on the cost of federal government as never before and this can be done with better understanding through the application of the budget plan, carrying a detailed balanced statement of proposed expenditures and revenue. It creates in effect through the function of a general manager, an appropriation committee of 35 members, reporting exclusively to the house all recommendations for appropriations, the house originating all revenue legislation, and takes the place of 13 committees which now divide this work. It also provides for the audit and control of the expenditures of the government by a controller general acting independently of the administration and representing congress.

Decision of congress to adopt a budget system of government was due in no small degree to the growing pressure from business interests to cut expenses of the nation in order that war taxes may be scaled down. Both Republican and Democratic leaders in congress say, however, that, at the present rate of outlay, they do not see how the present revenue law will raise enough to meet appropriations for the fiscal year 1920. It now seems there will be a deficit of about $1,000,000,000 and if success is achieved by those demanding a bonus for soldiers this amount will be increased to at least $2,000,000,000.

Taxes, however, came down for the calendar year 1919, payable in 1920, automatically, by the operation of the current law.

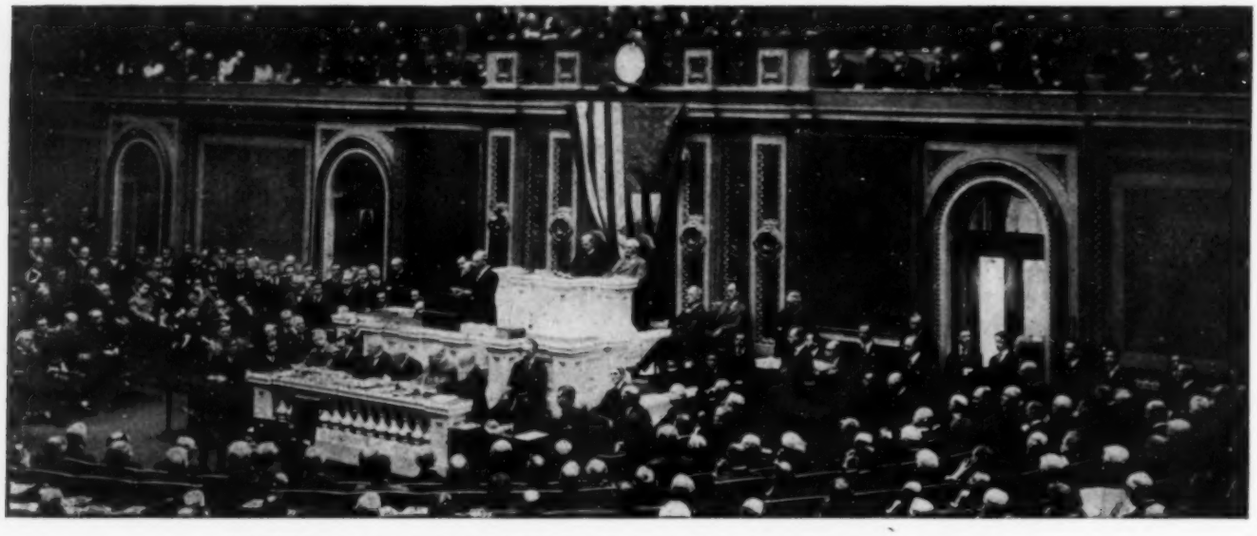
The war profits tax has proved the more productive and the effect of its repeal will cut the yield from this source by probably one-half to $1,250,000,000. The cut in letter postage from 3 to 2 cents deprived the government of an income of approximately $100,000,000 a year. The total yield of the individual income and the corporation profits tax for the calendar year 1918 is placed at $4,700,000,000 and reductions in rates as automatically provided are expected to decrease the return from these sources to about $3,000,000,000. For the fiscal year 1920 total expenses of the government are expected to go to $8,000,000,000 and its total income it is estimated will be $6,000,000,000, which is a much larger amount than otherwise would be because the collections in part fall on some of the largest profits growing out of the war. For the calendar year 1921 it is estimated government expenditures will total $5,000,000,000, unless $1,000,000,000 of treasury notes goes over to that year. In 1923 war savings stamps to the value of $1,000,000,000 fall due, and in the same year the Victory loan of more than $4,000,000,000. In 1928 the third Liberty loan of $3,250,000,000 comes due, although a great part of this will be refunded.

Saving by Railroad Systems

Opinion is almost unanimous that one of the chief contributing causes of the high cost of living is the excess profits tax and that it is a heavy burden to business as a whole, but despite the wide demand for its repeal congress is unable to conceive how this can be done for some time. Government control of railroads also has been held to be an important factor for heavy taxation. The total operating deficit of the carriers under government control at the end of 1919 was estimated at $300,000,000, while the total deficit for the two years of government operation probably will amount to $500,000,000.

Another reason why business wanted the railroads returned to private owners is that it would stimulate industry through increased buying. But it has been desired above all else that they be returned on a satisfactory basis. Generally, legislation for this purpose meets this demand in part only. The house bill passed the lower branch of congress at the special session but the senate was unable to consider the legislation then. The former measure, introduced by Chairman Esch, of the committee on interstate and foreign commerce, adhered to conditions prevailing before the war, with a plant for an enlarged and more powerful interstate commerce commission. The senate bill, introduced by Senator Cummins, chairman of the committee on interstate commerce, would reinforce the commission with a transportation board, divide the railroads into at least 20 systems for regulation and rate-making purposes, and deprive the more profitable companies of excess earnings, part of the sum going to labor and part to the weaker lines. The Esch bill insures compensation to the railroads for the first six months after their return which shall be equivalent to the average for the first six months of the so-called test years of 1915-16-17. The Cummins bill guarantees a return of 5½ per cent on the investment.

All things viewed, it may be said finally that the tendency of national legislation is of a favorable character, even if this has not been as much marked as could be desired. Problems of peacetime are being attacked with vigor and progress clearly is being made toward the completed task imposed by the period of reconstruction, however arduous, complex and difficult the accomplishment of that task is proving to be.



PRESIDENT WILSON PERSONALLY DELIVERING A MESSAGE TO JOINT SESSION OF CONGRESS

French Works Facing New Trials

Production of Raw Materials at Lowest Ebb Since Before War, While Lack of Coal and Transportation Facilities Also Serve to Slow Down Plants—Output Insufficient for Nation's Needs, But America Gets Little Business

BY FRANCIS MILTOUN
French Correspondent of The Iron Trade Review

ONE year's lapse from the advent of peace finds the French metallurgical situation bound up entirely with the resumption of the normal production of raw materials and the improvement in the means of transport. Unfortunately in mid-November these were at the lowest ebb since before the war. This situation further was complicated by the political agitation consequent upon the general elections which were to extend well through December.

Conditions in the metal industry particularly were acute because production of this character no longer enjoys government-ordained priority of transport, either with respect to raw materials or to the finished goods. Coupled with this fact is the increased cost of fuel, the insufficiency of mine output and the lack of adequate means of transportation. Stocks of coal from England and from America are lying on the quays of Dieppe, Le Havre and Rouen awaiting to be moved. The same is true of the coal that is being brought by water from Germany via Rotterdam. Largely this same thing applies to the coal stocks at the pit mouths of Lorraine and the Saar. To a large extent Alsace has had a priority call on this latter and usually has been getting what it needs while the contiguous metallurgical industries of French Lorraine, of Nancy and the Meurthe et Moselle have been suffering.

The domestic and industrial coal needs of the Paris region likewise have been at the mercy of the same lack of transport. By the last of November, however, partial supplies were coming through by specially-arranged fast freight, labeled specifically for Paris consumption and were not to be diverted enroute as so often had happened during the previous months.

So critical was the Paris situation in November that the use of industrial gas and electricity was cut down to half-time rations, part of the plants working nights and part days. This notably affected some 300 establishments in the metal trades, for the Paris region is still the chief industrial district of France. Above all the automobile industry was crippled, for in the Paris district are grouped by far the largest number of French manufacturers in this line.

In October German mines supplied France with but 17,000 tons of coal and coke combined, representing about one-third of expectations based upon the treaty terms of the Paris needs of 7000 tons per day, but a bare 5000 tons were coming through. At that the railways were not even sufficiently supplied and already the Northern railway has transformed 15 of its locomotives to experiment with oil fuel.

Two other examples of the coal famine may be cited, notably in mid-France, though that region has its own contiguous coal supplies. Transporta-

FRENCH RECONSTRUCTION COMMITTEE INSPECTING PLANTS IN NORTHERN FRANCE ABOUT TO BE REBUILT

tion again was at fault. At St. Etienne 2000 metal workers were idle for a week in November owing to a shortage of raw material. Another 2000 coal miners stopped work for a like period at the same time because facilities for carrying away the coal which they had been bringing to the surface were not available.

But two big French coal mines are employing more labor than before the war. Both are in the north. Bruay had 18,000 employed as compared with 12,000 in 1914, though during the war period 23,000 were on the payroll of these properties. Marles is employing 13,000 men as compared with 8000 in the prewar days. Two new shafts have been sunk by the Anzin Co. All these extensions for years, however, cannot make up the deficit caused by the destruction of Lens and Bethune.

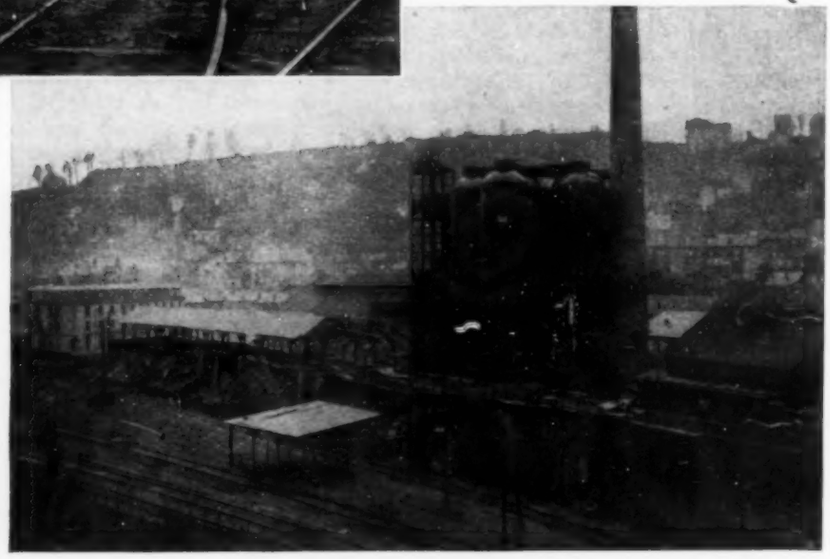
It is unquestioned that the delayed return to activity, as well as the recent slowing down in the metal trades in particular, has been due to a general coal crisis. The foundries and steel plants in the north and those in the east of France have been most affected. The plants of central France, Creusot and St. Chamond, and those of the Lyonnais, fortunately have nearby supplies sufficient for their needs, as have the shipyards of Toulon La Seyne and Marseilles.

During the last three months the situation had become acute in the Moselle iron and coal districts of Lorraine and in the Saar. This apparently was unforseen when the politicians and the economists were uttering their polemics concerning Briey in the French parliament. It became, however, a real and not a theoretical condition the moment the French got possession of that territory and sought again to put the iron and steel plants there into operation.

During that period raw material has been lacking thus causing much delay in the output of finished product. Merchantable product once turned out was forced to await transport before it could be delivered, though it may have been sold for months before on fixed orders. Railroad traffic was found to be entirely inadequate, and water-borne traffic had not yet been turned back into its former channels. In the Lille-Roubaix-Turcoing district in north France 30 associated iron founders were forced to shut down in late November because of a lack of coal and ore.

In the Moselle district the case was even more desperate since there is concentrated by far the biggest scale of iron and steel production in Europe That region includes Longwy, Briey, Thionville and the valley of the Saar. Indeed it also may be considered to include Luxembourg which now is under a French economic regime. Under German occupation, excepting only Longwy and Briey, and Luxembourg which was under the German Zollverein, an ore tonnage of 48,171-000, with an additional 10,111,000 tons of pig iron and 14,155,000 tons of coal were handled annually. Before that time, Germany had recognized that the time had come to provide for water communication by a canalizing scheme which should reach the Rhine at Coblenz and the Belgian Campine through the Moselle.

Today France has still to envisage a similar scheme with its outlets toward the west and north. No other plan will suffice. Either this must be done or the great metallurgical industries of the Lorraine region will languish. An interior navigation convention, held in October, resulted in a recommendation for providing the Moselle valley with water communication worthy of its great industry. This is an entirely new phase of the industrial development of Lorarine which the French apparently never had anticipated until they again came into possession of the territory. It took the breakdown of the railroads to demonstrate it.



RECONSTRUCTED BLAST FURNACES IN THE BRIEY DISTRICT, THE UPPER BEING THE AUBOUE, AND THE LOWER THE LOURRY

It is difficult to define the labor situation in France. The unrest of the past 12 months has been attendant upon the physical conditions brought about by the transition from war to peace, and the fact that workmen in all lines, especially those in the metal industries, came back from the battle-front to find living conditions impossible at anything like a prewar wage.

Naturally the next move was to demand, and to get, an increase of wages if not on the high scale set by munition production during the war period, at least to an amount representing 33 to 100 per cent over that prevailing before the conflict.

Unfortunately things did not stop there. In April there went into effect

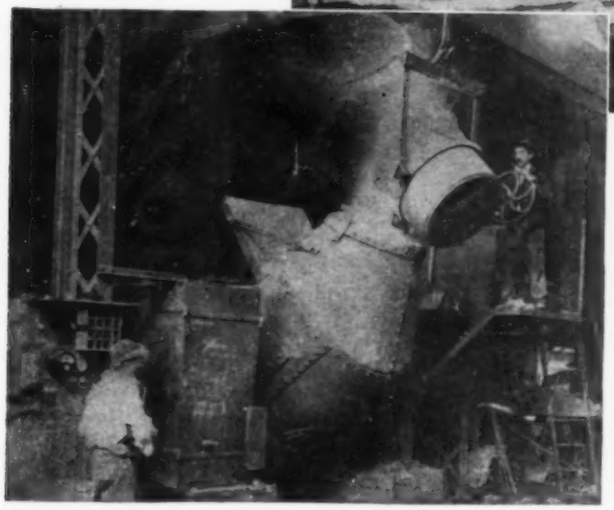
throughout France, with certain delays to permit readjustment, the 8-hour day, where formerly a 10-hour day had ruled. And production went down along with the diminished working hours as it was obvious that it would. This was serious enough in all industries but it was of great consequence when it came to the production of steel or coal. Coupled with all this was the political disruption whereby the hold-over French parliament was dissolved and general elections instituted throughout the country, covering a period from early November to late December.

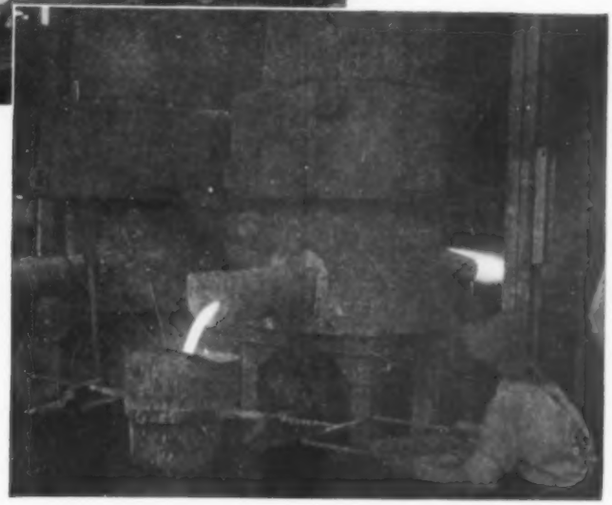
Many of the various trade and local strikes undoubtedly were political moves, such as that of the Paris press whereby but a single journal was allowed to appear in November. This kept the general public in the dark as to the industrial effort, or lack of it. To put down the labor movement in France as due to politics is the most just and charitable solution of the problem, though it must not be denied that the continuance of a low wage scale was out of the question.

Belgium was less stringent with regard to the hours of labor and her scale of wages is considerably, probably 25 per cent, more favorable than that in France. While France was working eight hours, or not working at all, Germany, save for periods of local disturbance, was putting her arms and shoulders to the job and was working overtime. Two French opinions state the case for and against the results of the 8-hour law. Monsieur Merrheim, secretary of the Metal Workers' federation, stated in November that at Saint Chamond, Saint Etienne and Paris, a reduced production came from the fact alone that raw materials in sufficient quantity were not forthcoming. Contrariwise Monsieur Dumuis, of the Acieries et Forges de Firminy, stated in an interview that it was all a question of securing an increased output from the labor employed. He admitted that this was not possible with the present equipment and an 8-hour day in the average plant, but that in his own, by improved methods, he had offset the effects of eight hours as compared with 10 before the war. In some instances he claims to have obtained an increased production. Forging and rolling operations were showing better results than ever before, castings output had increased, based on the per hour output; while blast furnace and open-hearth production were stationary. He considered this due entirely to a transformation of processes and the manner of handling materials and output to meet the deficiencies brought about by the shorter workday. He stated production costs went up in blast furnace and open-hearth operations but actually were reduced in the other cases. These two versions of the labor situation are representative of the divergent points of view in France. Aside from the plants of the invaded regions the entire iron and steel industry of France has suffered since the armistice from many unfavorable conditions which were physically insurmountable with the means at hand in this war-racked country. No figures are to be had showing how much this falling off of tonnage amounts to. Scattering indications, such as the shutting down of the 30 foundries in the Roubaix district, and a similar case in Lorraine, are eloquent but they are not conclusive for the reason that they are local manifestations, and also from the fact that it is hoped they are of but temporary force.

There are still 100 blast furnaces which might be lighted and ought to be in production. Practically the same proportion holds true of open-hearth furnaces. Chiefly these are in the reoccupied territories, but the same unsettled conditions obtain elsewhere in France.

When France entered upon the reconstruction period production figures showed deficiencies of 49 per cent in pig iron and 45 per cent in steel. As compared with the deficiency of but 25 per cent in pig iron and 21 per cent in steel in Germany the position of France was most unfavorable. It cannot be said that France now has arrived at the point where production is on as favorable a scale proportionately as that of Belgium or Germany. Specific instances may be better but a study of several months resumption of peaceful commerce in Europe indicates that the general situation





GLIMPSES OF FRENCH PLANTS WHICH HAVE RESUMED OPERATIONS. AT THE LEFT: A SMALL CONVERTER IN A LYONS WORKS. AT THE RIGHT: CUPOLAS IN OPERATION IN A TRANSFORMED WAR PLANT. ABOVE: A 30-FOOT PLANER AT ST. CHAMOND

can be summarized in this way.

Two illustrations will prove this, taking industries which are most important. In 1913 45,000 automobile chassis were produced and of these there were exports to the value of 220,029,820 francs. Imports were valued at but 19,245,940 francs. Machine tools were produced to the value of 65,000,000 francs and exports amounted to 16,000,000 francs, though imports were valued at 52,000,000 francs. Today French exports in those lines are practically nil. It is not enough to say it is unreasonable to expect France to be an exporter today, for France is not even a producer for its own needs in either branches of the manufacture listed. Though no tabulated official figures are available as yet for 1919, it is certain production has by no means reached the point looked for in the first week's immediately following the armistice.

During the past three months the production of French forges and rolling mills has been uncertain and irregular, largely because of the difficulties of obtaining raw materials. The Creusot works raised its price 18 francs per 100 kilos for ordinary bar steel; 25 francs for special steels; 20 francs for sheets below 3 millimeter in thickness and 25 francs for sheets above that thickness, either black or galvanized; and 20 francs for car wheels and nonwelded rims. This plant also reserved the right to revise prices on any orders accepted at these figures, presumably upward, in case of a further rise in the price of coal. It was not thought that this price advance would be general but Firminy followed with a 20 franc increase on all deliveries made after Sept. 30, and the practice became virtually universal. That the prices were justified there is probably little doubt since increased costs were in force in every operation from the mining of ore to the finishing of the machined product for the market.

Railway Service Cuts Shipments

The Lorraine plants, grouped under the Consortium, which includes among its members only those whose works had suffered from the invasion, had 85,000 tons of rolled bars in stock in November but were able only to make deliveries of 30,000 tons owing to the curtailment of service on the Eastern railway. This group also had in hand orders for 500,000 tons more with little likelihood of its being able to fill them on the given dates because of this same irregularity of transport, affecting alike receipts of fuel and ore at the plants and the delivery of finished products. Tubes and galvanized and black sheets both plain and corrugated have been greatly in demand and several plants which were out during the early months following the armistice have been returned to production at very profitable terms. Notably may be mentioned the Etablissements d'Escaut et Meuse and the Forges de Requignies. The latter bought plates for welding into tubes from Longwy while awaiting the restoration of its own output in this specialty. Longwy secured control of the Forges de Sedan, which was brought back to France by the American advance of late October, 1918. This plant specializes in tubes.

Casting Demand is Excessive

The French industry throughout the year was very active and would have been much more so had it not been for the fuel and raw material shortage. Construction castings and heating appliance castings were in great demand. There was more business in these lines than could be taken care of. This is shown by the fact that a coal vessel from America which discharged at Le Havre in late October brought also as a subsidary cargo 3000 heating stoves.

There is an apparent shortage of good foundry labor which in many instances is caused by the men having taken up less strenuous work at an equally high rate of wage or better. Foundry equipment in France is less modern than in America but everywhere there is evidence at present of an effort to bring casting methods up to date with a view of quantity production at lower costs. This pertains especially to the use of molding machines and of means to handle raw material and finished product mechanically rather than by hand. Electric trolleys, cranes and carriers are taking the place of wheelbarrows and hand-operated cranes.

Owing to a shortage of coke many foundries after they had resumed operations in the reoccupied regions were obliged to shut down or run on part time for temporary periods. The effect was serious for their product was in large demand to supply urgent local needs. An advance of 15 francs to 150 francs a ton on foundry coke, and a shortage of this fuel just when it was needed the most, together with the high cost of other materials proved most unsettling to production and distribution. This was true in spite of the fact that orders were plenty. The latter mostly were for small quantities which points to a holding back of bulk orders awaiting more favorable prices.

Steel and malleable castings are equally in demand and orders have been greater than shipments under the present handicapping conditions. The average prices for small castings have been from 250 francs to 300 francs per 100 kilos for medium runs. One of the most interesting developments in the French foundry industry is the expansion of the firm of Domange Freres at Denain into a stock company with capital of 3,500,000 francs. This plant is located in the heart of the region which suffered most from the invasion. Throughout the liberated regions foundries have been getting back into shape for future business, though not all of them are in actual production and very few are on a prewar scale. Local demands absorb practically their entire output. A decentralization movement is noted in the establishment at Crest in the department of the Drome in southeastern France of an important foundry formerly located in the north.

Wages in the foundry industry are tending towards the adoption of 20 francs per day as a base for molders. Paris labor is demanding an increase over this figure, due to the irregularity of plant operations. Conditions in the Ardennes and the east of France, however, more nearly are approaching the normal.

Building hardware and steel stampings have been greatly in demand. All manufacturers and dealers engaged in these lines have had business offered in excess of their capacity. Above all railway and shipbuilding needs have been most insistent, to the detriment of such business as originates with the smaller hardware trades. This more important business is being handled invariably at the expense of the lesser lines with the result that well-stocked wholesale or retail hardware shops seldom are seen.

America Gets Little Business

Foreign manufactured products to a considerable extent still are taking the place of home-made goods, as was true before the war in many instances. Building and accessory hardware, locks, hinges, rods for armored cement construction and ordinary domestic and industrial tubes and piping are being imported from England, America, Switzerland and to some extent even from Germany. All but America are getting a fair share of business in these lines considering the political and economical

conditions existing. The dollar at 9 francs 64 centimes, as was the case in mid-November, is the most handicapping price quotation France has been offered. Germany, with the depreciated mark, is by far the most favorable market in which to buy foreign merchandise in spite of the natural patriotic disposition to send no cash to Germany if it can be avoided. The stamping mills of the north and the Ardennes are working under that same relative restraint that has affected other branches of the metallurgical industry, and from the same causes. All these establishments have been forced to occupy themselves largely with the rehabilitation and re-equipment of their depleted plants and this has been a great obstacle to high production. A Franco-Belgian establishment, the Manufacture Ardennaise d'Estampage de Charleville, has under way a big project for the revival of a plant which was utterly wiped out by the Germans. This plant is not yet producing however.

The bolt and screw and rivet trade, including the whole line of what the French call *boulonnerie,* is having difficulty in meeting the demands upon it. Such plants as exist in running order, daily are being added to by the resumption of Northern and Ardennes plants which were shut down during the first months following the armistice. Standardized prices are an important factor in this trade and there is every possibility that such procedure will continue. Some prices are based on weight, others on lots of 100 of certain dimensions as to length and thickness. There is some local variation in prices but it is in this branch of this trade that the standardizing of prices and product has been most successful. It is probable that the plan of standardizing prices will be carried still further, and the only changes from the scale will be made to conform to geographical limits of delivery. Prices generally are based on a list, the discounts varying from 25 to 35 per cent. Carriage hardware is based on what is known as the "Loire scale," which at the moment shows a level 170 per cent over prewar prices. Wire and wire nails which have felt similar effects from the high cost of raw materials and of fuel, are being based on weights of 100 kilos.

Railway rolling stock and locomotives have been ordered extensively from such French plants as could handle this business. One of the most important orders for 100 of the Mikado type of locomotive was placed with Schneider's Creusot plant by the Paris, Lyons and Mediterranean railway. The State railway ordered of various French and Belgian factories 70 locomotives of the Pacific type.

Shipbuilding needs are very great and will continue to be. The situation is not quite clear though there is an undeniable disposition on the part of the French, including those of government circles to those of the industry itself, to build in France rather than to buy abroad. Raw material will have to be largely bought abroad, for the present at least, also much of the accessory metal fittings. The immediate needs of French shipbuilding which are to be filled by French plants, calls for 54,000 tons of plates and 22,000 tons of various structural shapes. These orders are to be filled by French plants, and call for 54,000 tons of plates and 22,000 tons of various structural shapes. The orders are to be placed under government sanction, at prices of 50 francs per 100 kilos for the former and 44 francs 50 centimes for the latter. These are for the construction of 28 cargo steamships and six steam trawlers as agreed upon by a triumvirate composed of the ministry of reconstruction, the ship owners and operators, and the builders. The prices quoted are considered very low in view of present conditions. Government arsenals which no longer are occupying themselves with war ships, are building six liners for the Indo-China trade, each of 16,000 tons. The plates therefore are to be obtained in the United States. French plate mills resent this and claim to be able to meet the demand at home. They claim also that since they have put their facilities at the disposition of the ministry of reconstruction they should be favored with the business. The decision to buy the plates in the United States is said to have been made because the prices quoted were lower.

The Lorraine situation still is in an unsettled state but a solution as to how the sequestered plants are to be handled is approaching rapidly. French interests are buying interests in those plants with the result that the last vestige of one-time German ownership soon will be eliminated.

The following list shows what these plants will bring to the French iron and steel industry when once they are embraced in that nationality. The output being the normal monthly rate:

BLAST FURNACES

Stumm furnaces at Uckange, output 20,000 tons, 400 employes.

Redange, output 6000 tons, 300 employes.

Ottange, output 7000 tons, 400 employes.

Audun-le-Tiche, output 16,000 tons, 300 employes.

Condition of Briey Iron Mines in Mid-November

Valleroy:—Little damaged.

Auboue:—Mines incapable of production to a greater extent than one-third of the prewar rate. Machinery little damaged but as operations during the war period were carried out without method the mines are demanding increased attention.

Haut-des-Trappes:—Only within the next year can production be expected on a scale approaching that before the war.

Joeuf:—Can be got into production shortly on a scale approaching its former output.

Moutiers:—Production soon can be brought to half of that before the war.

St. Pierremont:—Expected to be put rapidly in full production.

Pienne:—Mine flooded. No probable date can be given for restoring it to working order.

La Mouriere:—Two-thirds normal production expected in a year's time.

Landres:—Production can resume as soon as considerable repairs are completed.

Tucquegnieux:—Can be put into half production rapidly.

Anderny-Chevillon:—Soon to be put into normal production.

Nancy:—Already in production.

Ammermont-Dommary:—Mine flooded; no date fixed for inauguration of operations.

Joudreville:—Mine and installations but little damaged and normal output looked for in a short time.

Rochling-Thionville, output 12,000 tons, 450 employes.

Mazières, output 12,000 tons, 400 employes.

STEEL PLANTS

De Wendel—Hayange and Moyeuvre, output 50,000 tons, 7000 employes.

Thyssen, Hagondange, output 30,000 tons, 5000 employes.

De Rombas, at Rombas, output 25,000 tons, 5000 employes.

D'Aumetz at Kutange, output 40,000 tons, 5500 employes.

FOUNDRIES AND FORGES

Société des Cylindres de Bouzonville, rolling mill cylinders, 250 employes.

Fonderie Coldbert, Metz-devant-les-Ponts, 30 employes.

Thyssen Foundry, Ars-sur-Moselle, output 200 tons, 130 employes.

MACHINE SHOPS, ETC.

Kammerich Werke at Thionville, fabricated steel, 150 employes.

Constructions Metalliques Stahler, Basse-Yutz, output 500 tons of boilers and fabricated steel, 90 employes.

Etab. Julius Klaas, Basse-Yutz, wire and wire netting, 30 employes.

Karl Haberer & Co., Metz-devant-les-Ponts, bolts and builders hardware, 200 employes.

Risenkonstruktionwerk, Metz-devant-les-Ponts, steel fabrication, 20 employes.

Siegen Lothringer Werk, Hagondange, blast furnace materials, 240 employes.

Maschinen Fabrik Wainzolius, Metz-Sablons, fabricated steel and boilers, 60 employes.

Type-Founding Company Dannaberg, Ars s/Moselle, printing type, 50 employes.

The final readjustment of affairs in German-Lorraine has proceeded but slowly since the armistice. It was only in November that a specific statement was made as to the liquidation of the sequestered plants. Only then the regional tribunal of Metz gave its sanction to the winding up and transferring of the following properties, which are allied with some of the industries in Luxembourg:

Rumelange-Saint Ingbert, Deutsch-Luxemburgische, Gutteoffnungshutte, all at Ottange.

Dillinger Huttenwerke, Phoenix, Guteoffnungshutte and Bochumer Verein at Redange.

Gebruder Stumm and Dillinger Huttenwerke at Uckange.

Engineer-General Bourgoin, of Metz, has been charged with the formalities of liquidation. When the technicalities finally are completed these and the other sequestered plants of German ownership still in abeyance will have come under French control. Offers will be received for a period of one month and it is expected the transactions will be completed during the early part of 1920.

In November when Creusot shares rose to 9220 francs, it was made public that this company had bought, for 26,000,000 francs, the plant and mines of Adun-le-Tiche, near the Luxembourg border, which had belonged to the former Gelsenkirchen group. In addition, in participation with de Wendel interests, Schneider & Co. acquired the plants and mines of Avange, Aumetz-la-Paix and Reichsland, as well as the unexploited concessions of Herkules, Vereinigte, Empel, Ancy and Mardigny, the whole representing an investment of 110,000,000 francs.

The Acièries de la Marine et d'Homecourt at the same time bought in the Differdange and Rumelange steel plants belonging to the Deutsch-Luxemburgische company for 170,000,000 francs. It also acquired Rombach-Mazières, an important group of 10 blast furnaces and three ore deposits, at a price of 125,000,000 francs. Thus the Homecourt-Jocuf combination finds its natural prolongation into the Orne valley which was denied it when this part of Lorraine was in German hands. In addition it acquired the Rombas plant, near Thionville for 125,000,000 francs. An increase in the capital stock of Acieries de la Marine et d'Homecourt is looked for in 1920. Its profits for 1918 and 1919 were 11,836,000 francs. Monsieur Hemer, chief production engineer of Homecourt, has been appointed working director of the Rombas plant.

Another group, the Societe de Participation Minière et Metallurgique d'Alsace et Lorraine, composed of de Wendel, Chatillon-Commentry, Neuves Maisons and Schneider, is to share in the exploitation of the Aumetz plant of the Lothringer Huttenverein. The sum adjudged is 110,000,000 francs. The plant comprises 10 blast furnaces, one steel mill, three iron deposits in fee simple and a share in one other.

Another tie binding the Homecourt and the Pont à Mousson plants is the recent appointment of M. Camille Cavallier of the latter organization to a directorship in Homecourt and Micheville. On all sides apparently the tendency is toward consolidation.

DELEGATES TO THE PEACE CONFERENCE VISITING THE BLAST FURNACES AT DENAIN

Forts above Liege and repaired bridge, Pont des Arches

Belgian Industries Are Forging Ahead

Operations Now 50 Per Cent of What They Were Before the War—Credit Arrangement With American Interests Proving Beneficial—French-Luxemburg Pact in Effect

BELGIUM'S year of peace has resulted in a revival of its industrial and economic life to at least 50 per cent of what it was before the war. Plants, machinery, labor and transportation are in full progress toward a condition approaching the prewar status. Only the immense amount of work required in getting wheels turning has prevented more rapid progress, although during the later months of the past year the delays in obtaining ore and coking coal caused a slowing down of production.

The country's economic and financial situation is most encouraging. A beneficial factor was the agreement arrived at with American interests under the guarantee of the Belgian government, whereby a credit was opened in the United States in October for the equivalent of 22,000,000 francs. This was planned to cover commercial operations with America, and the sum was actually apportioned to a credit which was to apply on the acquisition of American machinery and tools.

The total arranged for was ultimately increased to the ruling exchange equivalent of 480,000,000 francs, which was intended to extend material aid to a combination of 500 Belgian industrial organizations in various productive lines.

How steadily Belgian prosperity advanced in the last months of 1919 is plainly shown by these figures, and also by the fact that in November Belgian francs were at a premium of 8½ per cent as compared with French francs. Another illustration is afforded by the amount of taxes collected in the first eight months of the year. This was 506,949,133 francs, as compared with an estimate of 469,610,285.

The Brussels stock exchange and the metal exchanges of Liege, Charleroi and the Mons district are seeking the establishment of a standardized series of quotations of market fluctuations in their respective industries. This is intended to co-ordinate offers of supplies and the demands concurrent therewith, giving due consideration to the signs of the times and technical contingencies of the moment. Economics, finance and industry all enter into the plan. Prices are bound to fluctuate, but they are believed by Belgian experts of the metallurgical industry to fluctuate on the basis of speculation rather than on underlying conditions of production.

If such a co-ordination as proposed is achieved it will not mean a uniform, increasing or cutting of prices, but rather that prices will be established on a base scale with percentage fluctuations up or down, according to ruling conditions arrived at by a study of physical variations. Belgium is confident that with her high production and low costs she will prosper.

INDUSTRIAL recuperation in Belgium has far outstripped that in France during the past year, according to this review of the situation in Belgium, written by one of THE IRON TRADE REVIEW'S *European staff, who has made a thorough study of conditions in both countries. While production in both France and Belgium has been retarded by the lack of raw materials, it is shown that greater progress has been made in getting plants in Belgium into operation or ready for operation. The status of Belgium iron and steel industry is described, and interesting comparisons are made with the industry in France.*

Now that France has made an economic alliance with Luxemburg, it is almost a matter of life and death for Belgium to take some concerted action through its various industries and make the Belgian standard recognized throughout Europe.

For mere bulk France, with regenerated Lorraine and Alsace, is far in the lead, and the Luxemburg alliance simply makes assurance doubly sure so far as the metal industry is concerned, but Belgian leaders claim that Belgium still has the whiphand in the industry.

The question of most concern to Belgium is whether she can hold her own in world competition. It would appear that her chances of doing so are very good. If some standardized system of buying, operating and marketing can be brought into operation in 1920 the country's progress will be no less remarkable than has been its rapid recovery from the plague of war.

Belgian plants have orders in hand for many months, and are not required to seek new business. The difficulties at present are solely those of inadequate equipment and insufficient supplies of raw material.

The latest figures available as to the status of the Belgian industry are those of Oct. 1. Only three blast furnaces were in operation in July but this number increased to 12 by October. The most notable resumption of activity was that of the Sambre et Moselle Co., three out of its four blast furnaces having been rehabilitated and only were awaiting coke supplies to be relighted. On Oct. 1, 11 other blast furnaces in Belgium were ready for operation.

Monceau-St. Fiacre had three blast furnaces demolished during the war and Esperance-Longdoz one. The four blast furnaces of Thy-le-Chateau are in process of reconstruction, as are those of Boel. The Bonehill furnaces were completely destroyed. Angleur is constructing another furnace in addition to the three it had before the war. Ougrée-Marihaye and Cockerill are making haste slowly and have actually in operating condition five blast furnaces between them, while Marchiennes and La Providence will soon be able to operate at least three in addition to their present equipment. This indicates that Belgian production of pig iron is proceeding at a pace far ahead of that of the French industry in the contiguous war-torn territory. The following gives additional details as regards operations in Belgium:

Districts	Blast Furnaces Existing	Lighted	Unlighted
Hainaut and Brabant—			
Sambre et Moselle	1	.	4
Moncheret	1	.	1
Thy-le-Chateau	4	.	4
Sud de Chatelineau	2	.	2
Hainaut	4	3	1
Bonehill	.	.	.
Monceau	3	.	3
La Providence	5	1	4
Usines de Chatelineau	2	.	2
Clabecq	2	.	2
Boel	2	.	2

THE BONEHILL PLANT AT MARCHIENNE-AU-PONT, BELGIUM, NOW BEING REBUILT

Liege District—			
Cockerill	7	2	5
Ougree	8	3	5
Angleur	2	1	1
Esperance	2	.	2
Grievegnee	1	.	1
Luxemburg (Belgian district)—			
Athus	3	1	2
Halanzy	2	.	2
Musson	2	.	2

The Cockerill company is employing 6000 workmen in iron and steel production, its output in November being 20 per cent of that of the same month in 1913.

The recuperation of stolen machinery from Germany has been going on apace. Up to November more than 500 machines and tools of various kinds were recovered on behalf of the Cockerill company.

The Belgian recuperation services, with headquarters at Wiesbaden, made the following statement of operations for the last fortnight of October: Recovered 609 machine tools, 260 tons of finished products and 344 other objects. Returns for the month of October also indicated the following "identifications": 220 machine tools, 2528 other objects and 1200 kilos of various manufactured articles.

In November the Athus-Grivégnee plant, which lighted its first blast furnace in April, fired another, while a third has been in condition for operating since September. The plant has been thoroughly modernized for low-cost production.

Production Retarded

Despite the good progress made in the restoration of plants, production of pig iron in the last weeks of the year was insignificant. Foreign pig iron was too costly for conversion in Belgium and the same was true of other semiraw materials. Consequently Belgian steel mills were forced to slow down after their courageous sprint. The result is that an unlooked for advance has been made in the price of steel.

The Belgian metallurgical industry has been further handicapped by lack of coke and ore, but the labor situation has interfered far less, although many Belgians are being induced to cross the border into northern France. Belgians were the most numerous of all foreigners in France before the war, the Italians being next.

During the first six months of 1919 the four chief coke producing centers in Belgium were turning out the following percentages of coke as compared with the index number of 100 in 1913: Borinage, 50; Centre, 33; Charleroi district, 10; Liege district, 7.

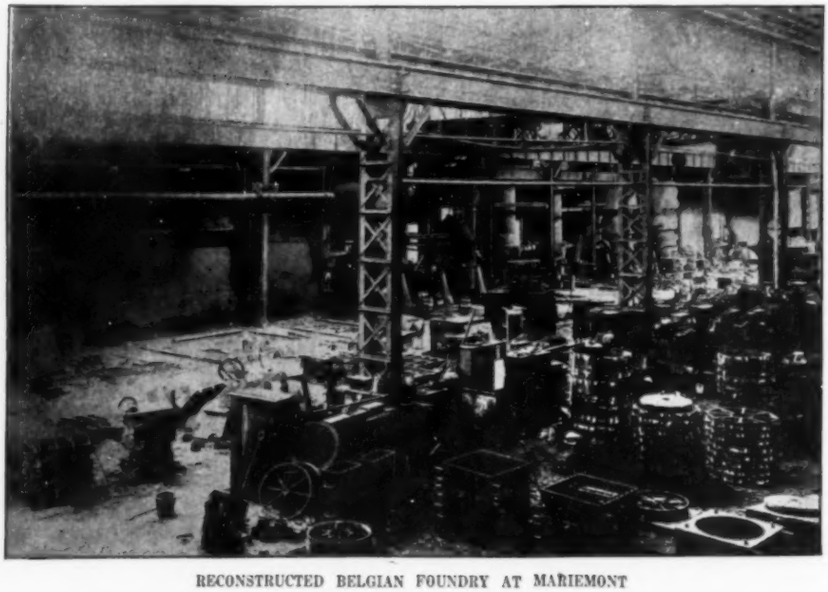
During the last three months production did not quite reach these figures, and the demand was considerably greater. About 600 coke ovens were in operation as compared with 2000 that could have been made use of and 2500 or more which existed before the war.

As to transportation facilities both by water and rail, Belgium has advanced proportionately far ahead of France.

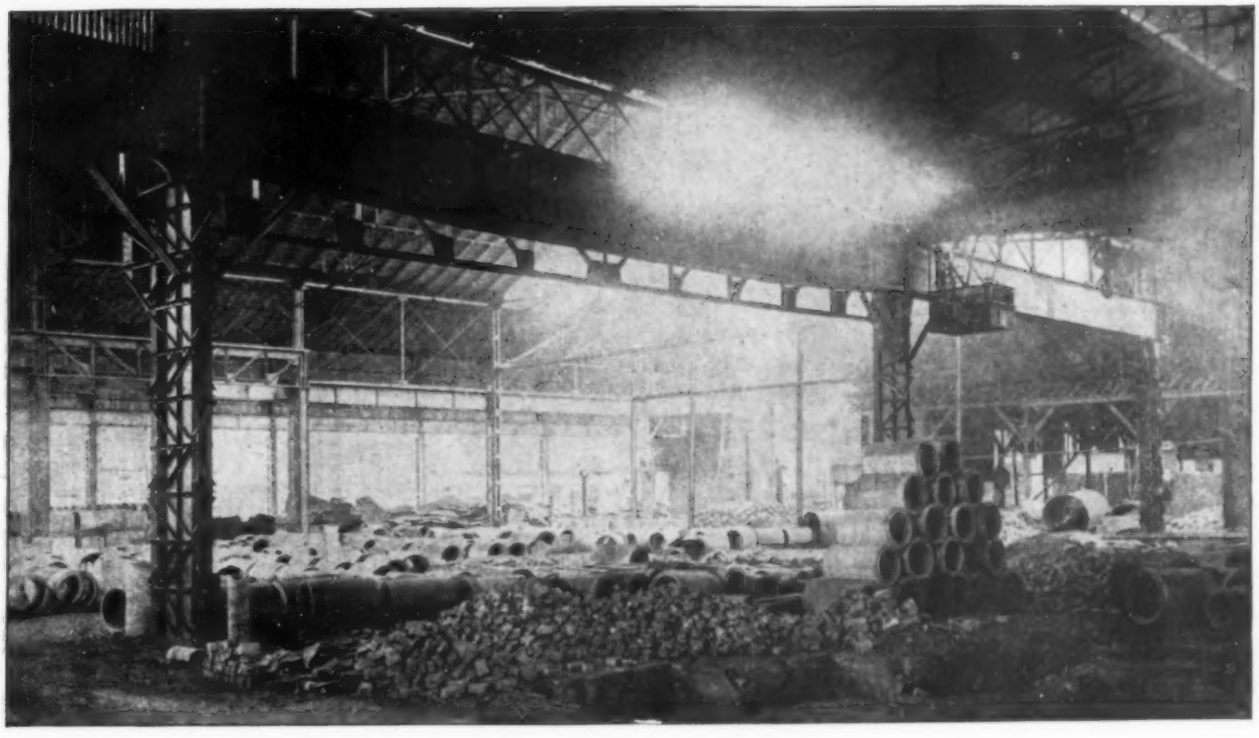
The withholding of Luxemburg ores for some unknown reason in October and November caused a marked deficiency in production of many furnaces. This may have been caused by the new policies born of Luxemburg's alliance with France on economic matters, or it may have been caused by Luxemburg's policy of demanding coal from Belgium in exchange for ore. In this latter case it is obvious that the Franco-Luxemburg combination of industrial economics is working well for those countries. All the Luxemburg plants were undamaged and are now practically assured of operation by the use of coal either from France or the Saar valley. Some hidden policy undoubtedly is responsible for it all.

That Germany cannot, or will not, send coal from the Ruhr to Belgium is offered as another explanation, but at all events the coal question is predominant. Gas and coking coal produced in Belgium is not sufficient, and France and England, who so largely supplied this before the war, are now powerless to help.

The peace treaty provides for a considerable annual tonnage from Germany, but monthly averages already delivered do not indicate that the expected monthly deliveries will be arrived at for some months to come, particularly as France has a first call



RECONSTRUCTED BELGIAN FOUNDRY AT MARIEMONT



CHARLEROI STEEL PLANT AS RECONSTRUCTED FROM THE RUINS LEFT BY THE GERMANS

on 22,000,000 tons a year. Late in the year an agreement was made for 15,000 tons monthly of gas and coking coal, which France would ordinarily have taken from Germany. This will prove of inestimable help in getting Belgian blast furnaces into operation. This arrangement is explained by the fact that the transportation facilities of France are such that that country can readily allow this subtraction from the surface stocks at her command at German mines with the reasonable certainty of their being replaced when she has freight cars available.

Great Industrial Expansion in Italy

Staff Correspondence of The Iron Trade Review

ITALY is prosperous; not so prosperous as it might be but, like Belgium, Italy has struck her working gait in the aftermath of war. The country's great handicap is her lack of coal, and the necessity of buying abroad. There is plenty of iron for her present needs, and Italian ports are not far away from the Spanish ore fields from which the mineral may be brought more cheaply than from Lorraine by rail, or even from Silesia.

A royal decree recently lightened import restrictions, though still limiting purchases abroad. Luxuries, goods which can be produced at home, and others which are "controlled" under a government monopoly are still restricted as to importation, but raw materials, machinery, tools and accessories for the efficient handling of home and foreign trade are practically free. In this classification are steel in all its raw and semi-finished forms, pig iron, billets and blooms, but shapes, sheets and plates, wire, tubes and pipe are restricted still, as are all other finished metal products. Beyond this, importations depend largely on credit and price, based on the low value of the lira as compared with the dollar and pound sterling.

The labor problem is paramount, but there is an ample demand for workers, and if socialistic legislation is not enacted there is little to be feared on this score.

Financially, in relation with the outside world, Italy is not particularly well off, as the lira, nominally worth 19 3/10 cents at before-the-war exchange, is now at a discount of 25 per cent as compared with the French franc, and that today is worth only a trifle more than 10 cents, though its former par was the same as that of the lira.

Signor Schanzer, the Italian minister of the treasury, just after the autumn elections, stated: "Italy has the courage and resolution to vanquish all her difficulties. Those who do not know Italy and see it only from afar have a very unjust opinion of the capacities of the Italian people. No fears for the economic future of Italy are justified."

Emigration is greatly curtailed as compared with a decade ago. It dropped nearly 50 per cent in 1914 and 60 per cent or more from that figure in 1915. For this reason it may be said to have stabilized the labor problem for the time being. More than 300,000 Italian soldiers and their families returned to the country from the "two Americas" during the war. Besides Italy's population has increased several millions by the absorption of the Trentin and Trieste, saying nothing for the moment with regard to Fiume.

Italy's wage bill in the iron and steel industry has soared since 1914. Italy, like France, so far as the wage earners are concerned, is on the

ragged edge of uncertainty as to whether there is to be an increase of wages or a reduction in the cost of living. The opinion is general that both will go down.

Italy, like Belgium, is fast approaching its prewar prosperity. Italy, to be sure, did not suffer invasion in its industrial regions as did France and Belgium, but Italy lost about a half million men from production, and Italy's industry was nearly at a standstill for four years so far as results achieved along economic lines were concerned. There were wage-earning profiteers in Italy, as elsewhere, but there were, proportionately, far fewer manufacturers who made abnormal war profits than there were in France or England.

The 10-hour day was in force in 1913, while now the working day is eight hours.

Many Italian Miners in France

It is a curious fact that nearly 80 per cent of the miners of the French Basin of Briey were Italians. Up to the present Italy has not authorized the return of these laborers to France, but a mutual agreement was made Oct. 1, 1919, securing equality of treatment for Italian labor in France, and *vice versa*. This appears to be the first international labor agreement on record.

Italy is helping herself by making all possible use of her own national shipping facilities. It is practically the only European country extensively using its own ships in importing coal. Last July 20 Italian steamers arrived in Italian ports with coal from America. England failed to fulfil her contract for deliveries of coal to Italy in the latter part of the summer owing to the British coal strikes. She shipped only 350,000 tons per month, about half the amount received from America. A contract since placed with American shippers provides for specific deliveries of approximately 1,000,000 tons during the next eight months.

The Fiume gateway through which Italy formerly received large quantities of coal and briquettes from Austria has been closed to this traffic. How important it is to Italy to have the critical political puzzle relating to Fiume solved at an early date is recognized by the fact that Fiume with Trieste controls the entire traffic of the head of the Adriatic. In 1912 there was a yearly movement of 18,575 vessels in the port of Fiume and a tonnage traffic of 5,161,877. Naturally with its two-thirds active population of Italian descent or affiliation, Italy has her ambitions firmly fixed in regard to this important port.

Italian shipbuilding in the first six months of 1919 amounted to but 20,000 gross tons actually completed, but a tonnage of 225,050 was in process of construction in 14 yards. Shipyard wages in the Naples district run from 11 to 20 lire a day, which at ruling exchange rates is not much more than from $1 to $2, far less than paid in the metal trades elsewhere in the peninsula.

Considering that Italy was able to export so little during the war period and since, the balance of trade has gone greatly against the country. The "commercial deficit," the Italian nomenclature, shows minus figures of 5,302,000 lire in 1915, 5,473,000 in 1916, 10,682,000 in 1917 and 11,618,000 in 1918.

Italy's latent hydraulic power is estimated at 106,369,384 horsepower, and there are already in force 3274 hydraulic concessions in Italy. Italy is the foremost of European countries in development of waterpower and this will result greatly in her favor.

In 1917, the last year for which figures are available, Italy had in exploitation the following mining deposits: 28 iron, three manganese, seven copper, 83 lead and zinc, 11 antimony, one tungsten, seven mercury, 148 lignite and schist, 315 sulphur, 24 graphite and one bauxite. There are no anthracite coal deposits being worked commercially in the peninsula.

The foregoing and other minor mineral workings gave employment to 43,137 men.

In the same year there were in Italy three blast furnaces using coke, four blast furnaces using coal, seven electric furnaces and 37 steel plants in production. There were in addition 594 machine shops, foundries, automobile factories and shipyards, of which 141 were in Piedmont and 238 in Lombardy.

Much New Capital Invested

New capital invested in Italian industry during the war, nearly all of which is still employed, was remarkable for its volume, there being no government restrictions as to the launching of new companies as there were in France and England. Certainly this of itself points to an enormous industrial progress for Italy. The figures relating to new issues were: 1915, 196,734,000 lire; 1916, 409,987,000; 1917, 1,408,186,000; 1918, 3,154,054,000.

Practically all the industries in which this capital was invested were private auxiliaries of the government war establishment and are now virtually all back in private operation.

The following examples indicate the progress of the country's metallurgical industry. Ilva has recently negotiated for a large tonnage of billets and blooms in France. The Comptoir Siderurgique de France is to make the deliveries to the Italian company on the basis of 80,000 tons of semifinished products each trimestre of the 1920, engaging not to furnish, other than to Ilva, more than 20,000 additional tons of shapes, and that if Ilva desires it may have half of this amount. Prices are to be computed during the last two weeks of each three months for the three months to follow. Ilva has created, in addition to its capital of 300,000,000 lire, additional mortgage bonds to the value of 150,000,000.

Plants Are Being Improved

Ansaldo has completed an electric steel plant in the upper Val d'Aost, using its ample water power for cheap production.

The Terni steel plant is to produce railroad rolling stock, machine tools, and agricultural machinery. Its capital is being increased to 100,000,000.

The Officine Meccaniche Italiane, in Reggio-Emelia, is furthering its plan for quantity production of locomotives and cars, and has increased its capital from 24,000,000 to 36,000,000 lire, and has created 8,000,000 of new mortgage bonds.

The Porto-Ferrajo blast furnaces on the island of Elba, was required to suspend operations in 1918 owing to a lack of coal, but regularly shipped its ore to the mainland. Its confidence in the possibility of again operating its own plants in the island is plainly indicated by the increase of its capital to 75,000,000 lire.

The Italiana Nicola Romeo, with a capital of 50,000,000 lire, is putting out 60,000 bonds of 500 lire each for the development of its business.

The Ernesto Breda Co., with a capital of 100,000,000 lire, has enormous electric power at its disposal for its shipyards and steel works, and is now well launched on the production of agricultural implements after having devoted itself to the production of arms for over four years.

The F. I. A. T. has extended its efforts, and with Austrian capital is to manufacture cars and motors in Vienna. The capital is 25,000,000 crowns, of which F. I. A. T. of Turin holds the majority.

British Industry in Uphill Battle

Progress is so Slow, Due to Labor and Transportation Difficulties, That Country May Never Recover its Predominance in World's Markets—Ambitious Programs Unrealized, Though Steelmakers are Showing Great Enterprise

BY JOSEPH HORTON
British Correspondent of The Iron Trade Review

INDUSTRIAL Britain is fighting hard to get on its feet again after the war. Although a large output has been attained, and the latest board of trade returns show a slow recovery of exports, the rate of progress is unsatisfactory. At present the date seems far distant, if ever it arrives when the country will recover that almost unchallenged predominance in the world's markets which was its pride for generations. The position of manufacturers strongly recalls those celebrated families who are said to have maintained themselves by taking in each other's washing, probably near relatives of Thackeray's heroes who mastered the art of living on nothing at all.

The country was much more successful in turning to war production than getting back to the ways of peace. Labor must be credited with the chief responsibility for the slow progress. Higher wages and shorter hours appear to be the chief concern of workmen. Although the demand increases, and orders running into millions of pounds sterling in value are turned down every week, overtime is steadfastly forbidden, the manager who suggests it usually being snubbed for his temerity. It is reported that one of the largest engineering shops in Britain is about to close down, the molders' strike which has continued nearly three months having stopped the supply of steel castings, while all reserves have been used. The workmen have spent all their union money, and in many places their wives and families are largely maintained by charity. The latest development is a declaration by the employers that the men must return to work before negotiations are resumed. To this the labor leaders retort that this is a determined effort to starve the men into subjection, which they will resist. So the end is not in sight.

There is general satisfaction at the abolition of the out-of-work dole, as where this has been received by two or three members of a family, they have preferred to live in idleness than go to work.

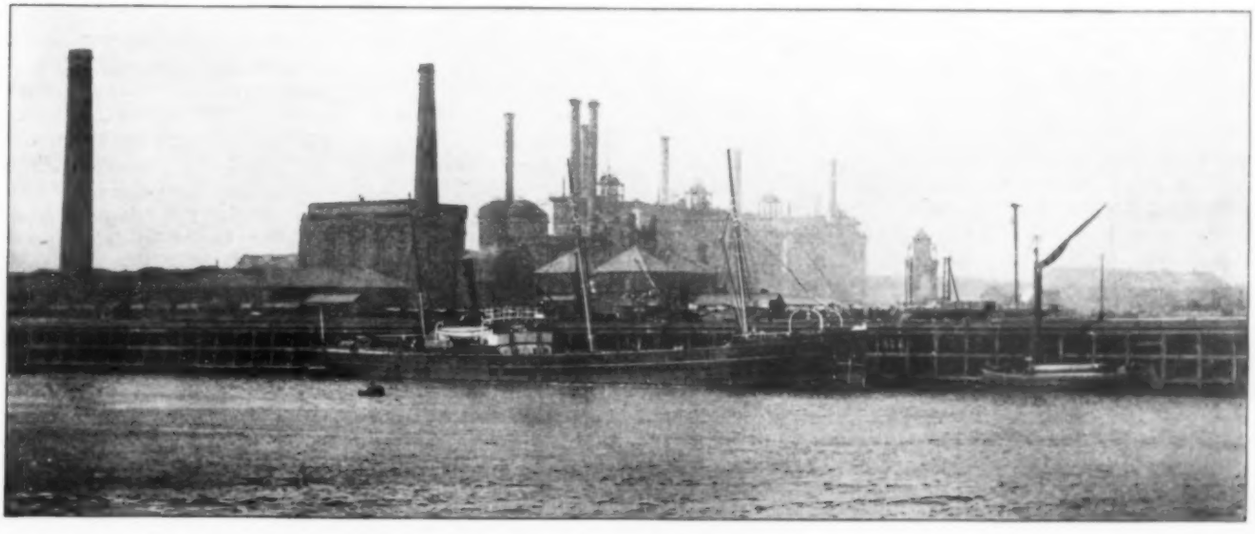
Foreign Trade Hampered

Shipping difficulties, dock congestion and deficient railroad service are combining to hamper foreign trade to an appalling degree, but these may be considered as the natural result of the war, which time and intensive production at the shipyards and car shops alone can correct.

The great works of Dorman, Long & Co., and the Cargo Fleet, at Middlesborough, on the northeast coast, were brought to a standstill Nov. 24 through the lack of railroad cars and consequent congestion at their yards.

A matter of vital importance to the trade generally and the iron and steel trades in particular is the announcement just made in the house of commons that domestic and household coal is to be reduced 10s per ton. No hint is given that industrial coal is to share in the benefit, and the statement of Sir Auckland Geddes is interpreted by many persons to mean that the price of industrial fuel may be increased. If this interpretation should be justified, a further serious handicap will be placed on trade, especially in foreign competition. The new development has increased the confusion and has discredited coal control. Apparently the step has been taken to pacify the miners who are threatening another strike.

Nothing more is needed to justify criticisms of the management of these vital elements of industry by outsiders who do not understand the business. The strict limitation of profits undoubtedly will discourage enterprise, as the coal owners have stated. On the whole the general outlook is anything but cheerful, the one redeeming feature of the coal situation being that under sheer compulsion the economical use of coal is more and more



CLARENCE IRONWORKS ON THE RIVER TEES, ENGLAND

imperative, and this must eventually prove of permanent benefit to production and commerce.

The close of the first year of peace finds the iron and steel manufacturers of Great Britain striving their hardest to realize the ambitious program of extension in capacity and production carefully elaborated during the war. The uphill struggle has been curiously parallel to the war itself, with the difference that while the war policy was largely impromptu, the iron and steel manufacturers prepared an elaborate program for their postwar policy. Everybody foresaw the vast postwar demand for iron and steel, and despite enormous difficulties the manufacturers initiated large extensions to meet the demand.

The prewar production of steel in the United Kingdom was about 7,600,000 tons. The departmental committee appointed by the board of trade to consider the position of the iron and steel trades after the war decided that the organization on modern lines should have in view the extension of the steel production of the country to 15,000,000 tons of ingots per year, involving the laying down of complete new units of blast furnaces, coke ovens, steel furnaces and rolling mills.

Benjamin Talbot, representing the National Federation of Iron and Steel Manufacturers, the most thoroughly representative organization of the trade, informed the coal industry commission in March last that when extensions then in progress were completed the capacity for production would be at least 12,000,000 tons of ingots per annum. This figure has been confirmed repeatedly since that date, and a number of the plants have been brought much nearer completion, while the most important are in partial operation.

Latest available statistics of actual production, namely from January to September, 1919, show that the total output of steel for the nine months was 6,074,000 tons. Assuming that for the remaining three months the same rate of production was maintained, the total in steel ingots for the year was 8,098,000 tons, or a little over two-thirds of the capacity mentioned by Mr. Talbot, only slightly better than the prewar production despite the large increase of capacity. The monthly average of steel ingot production in 1913 was 639,000 tons and for the first nine months of 1919 slightly under 675,000 tons.

The situation with regard to pig iron is worse and undoubtedly pig iron production is still, as it has so long been, the weak link in the British iron and steel trades. For the nine months referred to the total production of pig iron in the United Kingdom was 5,655,000 tons, a monthly average of 627,000 tons, which compares with 855,000 tons in 1913. The following figures for the first nine months of 1919 showing comparisons with Germany and the United States reveal that while Germany has receded more than Great Britain, the United States has made a large increase as compared with the prewar period:

In thousands of tons

	United Kingdom		Germany		United States	
	Pig iron	Steel	Pig iron	Steel	Pig iron	Steel
January	664	718	499	559	3306	3698
February	625	734	469	516	2940	3219
March	684	758	551	635	3090	3168
April	653	668	434	428	2478	2665
May	662	755	517	594	2108	2296
June	612	631	519	631	2115	2641
July	660	618	572	785	2429	2985
August	521	474	561	729	2743	3269
September	574	718	524	726	2488	....
October	...	...	...	...	1864	....
Monthly average in 1913	855	639	1582	1502	2581	2608

It will be seen that in all three countries and especially in the United States production in the second quarter was lower than in the first, but both in the United States and Germany production was recovering in August while in the United Kingdom, owing to the Yorkshire coal strike, holidays and other causes, the production was lowest, even less than production in Germany.

Export Situation Serious

The situation with regard to exports is much more serious. The total exports of pig iron for the nine months was 239,600, an average of 26,280 per month, compared with 93,700 before the war. The total exports of steel for the nine months was 1,356,000, a monthly average of 150,000, compared to 317,000 before the war. The following shows monthly exports of the United Kingdom in 1919, as compared with those of the United States:

In thousands of tons

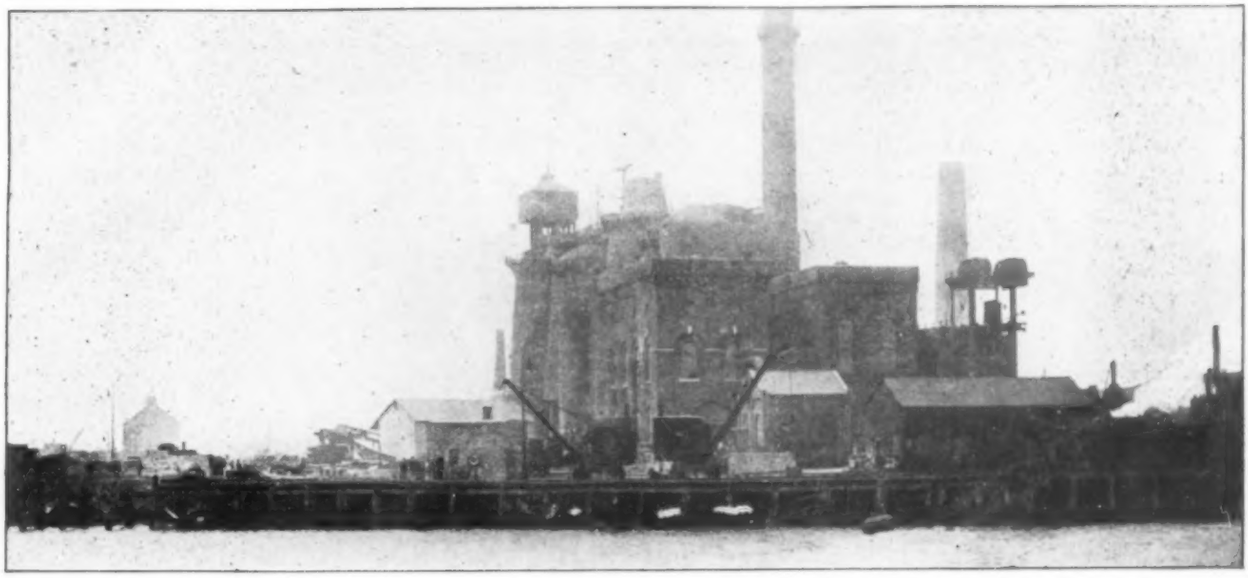
	United Kingdom		United States	
	Pig iron	Steel	Pig iron	Steel
January	34.9	134.1	36.7	283.7
February	21.8	86.2	20.8	295.1
March	21.3	136.7	22.2	318.5
April	24.6	146.4	17.0	362.6
May	23.9	182.1	37.1	332.4
June	27.8	166.2	39.8	475.0
July	23.4	166.6	42.2	284.2
August	30.3	181.2	....	.....
September	32.4	156.6	....	.....
Monthly average in 1913	93.7	317.4	23.9	217.0

At present the coal question causes the greatest anxiety to the iron and steel trades. Furnace coke in Middlesborough now costs about 50s per ton delivered at the works, and as it takes from 25 to 35 one hundred weight of coke to make a ton of pig iron the importance of the fuel question will be seen. Mr. Talbot's estimate before the coal commission was that approximately for every 1s advance in the price of coal 4s per ton is added to the cost of fuel for producing finished steel. The present cost per ton of coke is more than double that in the United States, and British steel manufacturers are aware of this handicap.

A much more serious question with regard to coal is the insufficient output. The statement made by the men that the reduction of hours in the pits would involve no reduction in output has been disproved. The insufficiency of coal is the great obstacle to bringing into commission more furnaces, coke ovens, etc., while the shortage causes occasional damping down of furnaces and stoppages of mills. Already agitation has been renewed for another increase in miners' wages, which may bring about another big coal strike by the end of the year. The results of such a strike would be calamitous. Apparently Sir Auckland Geddes is seeking to avert this by reducing the price of domestic coal.

The introduction of the 8-hour system, practically by order of the government in fulfillment of certain pledges said to have been given to labor wrought its worst effects on the Midland iron trade. The steel trade suffered less, because it was more readily adapted to the three-shift system, and in fact, had already largely adopted this. The most successful sheet makers have for years operated on this system, and have found it profitable and efficient, but with the iron trade the situation is different. All efforts to improve the South Staffordshire iron trade from the point of view of output and equipment have failed. Furnaces are fearfully wasteful of fuel. A competent authority recently declared that whereas 5,000,000 tons of coal per annum are used in the production of wrought iron bars, apart from the blast furnaces, "if the whole of the ironworks were properly equipped and provided with efficient furnaces and modern economical rolling and manipulating machinery there is strong ground for the statement that from 1,750,000 to 2,000,000 tons of coal could be saved per annum." In addition at least one-fourth of the present labor cost could be saved by installing thoroughly up-to-date equipment.

It is estimated that modern steel mills can produce a ton of bars with one-fourth the power cost in steam and one-third of the fuel used in ordinary ironworks. Despite this, the iron trade goes complacently on its way relying on the willingness of its customers to continue paying £22 10s per ton for the famous Staffordshire iron for which a big demand undoubtedly exists, and for which orders are far beyond capacity. Wages are now 162½ per cent above prewar levels; yet the trade would gladly



TEES IRONWORKS, ENGLAND, ONE OF THE LARGEST IN AN IMPORTANT STEEL DISTRICT

employ many more men than are available.

Once for a brief period during the year the trade had a chill, brought on by American competition. The largest tube makers in the kingdom found it profitable to make their tubes from gas strip brought from America, and the strip makers were so far impressed that they reduced their prices by about £1 per ton. American competition has now passed, due to labor troubles in the United States and the rate of exchange, and the Staffordshire makers go their easy way, charging their own prices, and choosing their customers. The foreign business refused would make an enormous total if it could be tabulated.

A huge business in semifinished steel is to be done when America, with its modern methods of mass and economical production, is in a position to "deliver the goods." There is a famine in semifinished steel which is keeping numerous rerolling mills idle. All other steelmaking countries save Great Britain and America are out of the reckoning and are likely to be for a long time. A good quality of mild steel can replace iron for many purposes, and will be bought if it can be sent in tens of thousands of tons. But its purchase will be greatly facilitated if some financial arrangement can be devised which will minimize the effect of the present unfavorable rate of exchange.

Output in all trades is increasing, but the home demand is enormous and the absence of foreign competition enables the maker to charge his own prices. On the other hand, foreign trade is difficult and troublesome owing to scarcity of shipping, poor transportation and exchange troubles, and it is hardly to be wondered at that the British manufacturer cultivates the business at his own door. In the opinion of many sage advisers, however, the Englishman may find in the long run that this is not after all a very wise policy for which in the not distant future he may have to pay the penalty. In the meantime the opening given to the extremely efficient and enterprising competition of America is obvious, and nobody in England doubts that the opportunity will be taken.

Exports from the United Kingdom were less than 50 per cent of the prewar exports, whereas in the first half of the year the exports from the United States were 50 per cent in excess of prewar exports. While exports of iron and steel from the United States before the war were about 60 per cent of those from the United Kingdom, in the first half of 1919 they were considerably more than double those of the United Kingdom. The decline in United States exports in July is attributed to strikes at the docks and the exchange situation.

A comparison of the two tables shows that the fall in exports is out of all proportion to the reduction in output, and the reason for this is readily apparent. Prior to the war a great deal of steel was brought in from Germany, which had first of all to be replaced.

In 1913 the total export trade in rails of the world was 1,594,421 tons of which the British percentage was 31.88. Probably no trade fell off during and since the war more than the British rail trade. Comparatively few rails are being made now in the north of England, and the rail makers there appear to be reconciled not only to their present loss of the business, but to a large prospective transfer of this branch of the steel trade to American mills. Rails are regarded as the product in which international competition will be keenest, and the British rail mills make no pretense to equality in massed output with the American mills, under this head. On the other hand they can make other products more profitably and the rail business, even for home requirements, appears to have been neglected relatively. It is significant that three large British municipalities, Birmingham, Manchester and Glasgow have placed orders for heavy tonnages of rails with America, not only on the ground of price and quality, but also quick delivery.

Another important branch of the export business is that of tin plate, steel and galvanized sheets. In regard to the last named, it is well known that before the war almost the whole export trade of the world in galvanized sheets was in the hands of Great Britain. The trade was completely shattered by the war, and South Wales which is the chief center of these industries is now fighting hard to get back its lost business. The tin plate trade employed 26,500 persons before the war and the galvanized sheet trade, 20,000. But a comparison of the three months ending with September shows that the amount of leeway still to be made up is enormous.

The total exports of tin and galvanized plates and sheets for July, August and September were 155,358 tons, which while showing a great improvement over the previous year is still 143,663 tons below the same period in 1913. The trade has experienced a temporary improvement through the practical absence

of American competition during strikes in the United States. But the high prices at which tin plates are selling must militate against foreign business, while the tin plate trade has its full share of the obstacles to production which afflict the iron and steel trades generally.

At present tin plates are costing from 45s to 46s per box, as compared with about 14s before the war. Galvanized sheets are costing £37 10s per ton as compared with about £12 before the war. It is difficult to see how the British product can meet any severe American competition at these prices. It is noteworthy also that the workmen in the Welsh tin plate industry recently took a ballot as to whether the working hours shall be six or eight hours per shift, and a large majority voted for six hours. If such a drastic reduction should be made another formidable obstacle will be introduced.

The question of exports of iron and steel must be greatly affected by the enormous output of ships, the building of which undoubtedly consumes the bulk of the steel produced in the Scotch and northeastern steel works. British shipbuilding has made record figures largely on account of the great increase since the armistice. At the end of September, the total gross tonnage of ships under construction in the United Kingdom was 2,816,773, an increase of nearly 42 per cent over the tonnage before the war. Although America is just now setting the pace in shipbuilding, there is not the least sign of any falling off in the demand for ships from the British yards and a long time must elapse before the enormous gap made by the German submarines can be filled.

Broadly speaking, the British steelmakers have not shown any lack of enterprise in rising to the occasion. Mr. Talbot's figures are more than justified, but it must be remembered that these figures were given in March last, and that extensions have since been continuous all over the country. The only exception to progress is to be found in the Staffordshire iron trade. The recognized steel centers have greatly improved and extended their plant. The growth at Middlesborough is very conspicuous. This, the youngest and perhaps the most progressive of the British steel cities, on the banks of the Tees, is making great progress, and among other projects are the reclamation of 1100 acres of tidal foreshore on the north banks of the Tees, the possible establishment of the Tees as the port of call for a large line of steamers, and the acquisition of a site for the erection of petroleum storage tanks. Large housing plans are being worked out. Bolckow, Vaughan & Co. are about to build a garden city of 300 houses and 500 additional houses are to be built by Dorman, Long & Co. in connection with their model village of Dormanstown, which came into being during the war. It is intended eventually to erect 6000 houses in Dormanstown.

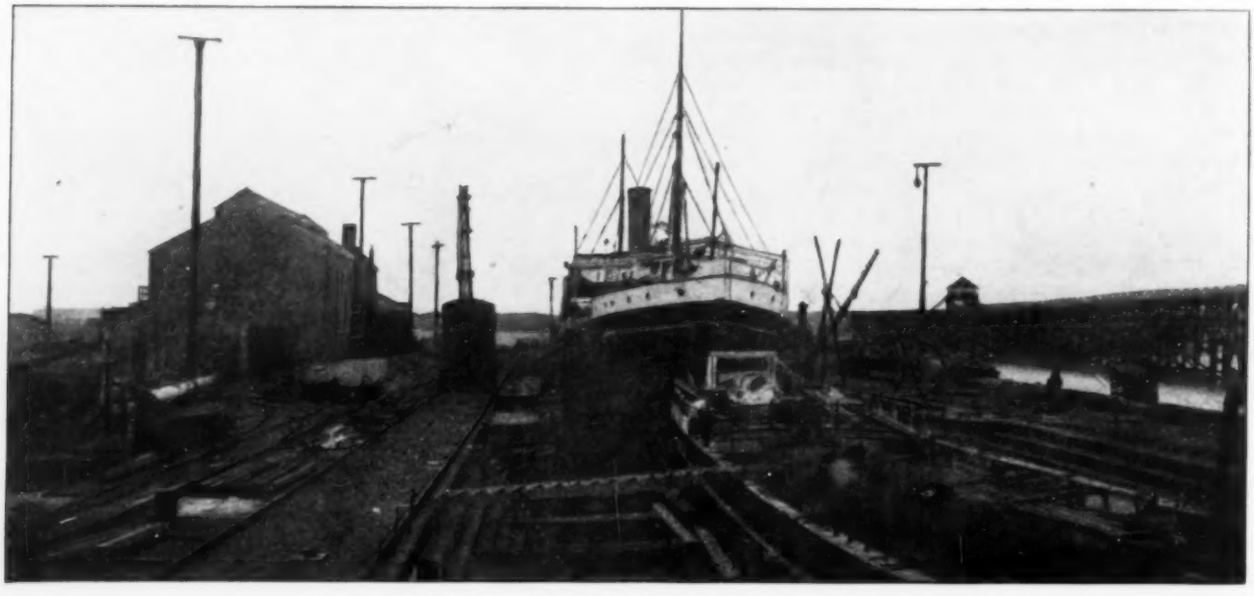
Dorman, Long & Co. also have laid out a great new steel works, embodying every up-to-date improvement. The Cargo Fleet works, the North Eastern Steel works and Skinningrove works are all engaged in making extensions and improvements. The same thing is being done in the Sheffield district where Steel, Peech & Tozer have laid out a complete plant. Messrs. Cammell Laird have a large complete steelworks in course of erection at Penistone. Several other steelworks in Sheffield are being extended, and in South Wales, Messrs. Baldwins, Ltd., have put up a large steel works. The Ebb Vale Co. have built new blast furnaces, and practically every one of the great Welsh companies is making extensions.

It must be remembered that work on all these extensions has gone forward in the face of the most depressing difficulties.

It is likely that difficulties of transportation will handicap production for the whole of 1920 at least. A month or two ago it was authoritatively stated that 80,000 railroad cars were awaiting repairs. Rolling stock generally is worn out, and though cars are being brought back from the continent at the rate of several hundred per week, few of them can go directly into commission for industrial requirements. It is the same with the engines, many of which are in a state approaching collapse. The locomotive builders have suffered severely through the molders' strike. At every engine-building and repairing depot broken down engines are awaiting the supply of parts which cannot be furnished until the molders get to work. Fears have been expressed that if the strike continues whole sections of railroads will have to suspend operation.

The steel trade suffers still more directly from the strike, through the stoppage of the heavy foundries which furnish rolling machinery. The difficulty will be shared by the Welsh tin plate mills, which are also supplied with rolls from the South Staffordshire, or from the foundries on the northeast coast, which are idle.

The two most serious matters are the deficient coal supplies and the inadequate railroad service. In the latter, the trade has suffered to some extent from the meddling policy pursued by the government.



GRAVING DOCK, RIVER TEES, ENGLAND, THE CENTER OF IMPORTANT INDUSTRIAL DEVELOPMENT

War Upbuilds Japan in Steel

Oriental Nation Bending Its Efforts to Make Itself Independent of Other Countries on Basic Industrial Material—Obstacle of Limited Home Ores Being Overcome in China and in Manchuria

BY J. A. RABBITT

IN REVIEWING the steel status of Japan I am reminded of a letter written in 1917 concerning the possible effect of the American embargo against her market:

"Until now Japan has only played with steelmaking. The Japanese can no longer follow the path of least resistance in having their bread of industry served to them by other nations, cut, drawn and shaped to their liking; the world will be surprised, or the Japanese themselves will be, at how quickly they can get ore from China and Korea. Both iron and coal are found in abundance in China, Manchuria and Korea, in close proximity to each other, and like magic we will see blast furnaces erected at the mines with transportation facilities installed for delivering the ingots to Japan for refining and working into commercial tempers and shapes. Japan will be reawakening to a new power, the power that will enable her to produce the material for her tools, her guns and her battleships which heretofore she has been content to merely work into shape."

At that time only $50,000,000 was invested in the iron and steel industry in Japan. A year later more than $150,000,000 had been invested to meet the needs of the 130 foundries which had sprung up during the four years of the world war. In 1913 less than 250,000 tons were produced, which was more than doubled in 1917, an indication of the basis on which was founded the prediction of Japan's reawakening to new power.

The rapid equipment of these foundries shows very surprisingly both Japan's needs in the iron industry and the sound basis on which she set to work to build up her independence, in her recognition at the outset of her natural resources and limitations. Forty-three melting furnaces, 74 flat kilns, 17 rotary kilns, 31 crucibles and 117 electric kilns, the last an evidence of the realization that Japan's splendid natural power could be utilized in this way, show the extent to which she is getting under way. In addition, 186 melting furnaces are under contemplation.

It is generally recognized that Japan aims not only to be an industrial nation but the leader in the industrial development of Asia. The industrial position of any nation can be measured largely by its steel activities. A comparison of the leading steel countries, showing the consumption in kilograms of pig iron per capita from 1910 to 1913 reveals how high Japan has set her goal and how far she still must go. This comparison is as follows:

America	Germany	Great Britain	Japan
296	148	140	22

Japan realized her poverty of mineral resources long before the world war and made some effort to acquire iron and coal holdings. The war defined her effort to get needed supplies in the United States as elsewhere and set her to developing her own islands and colonies and to acquiring concessions and privileges in China.

There are only three sizable mines in Japan proper and their output has been less than 150,000 tons annually. Early in 1918 the government started prospecting in Nigata Prefecture where 6,000,000 tons of excellent ore were estimated to exist. Private enterprise is prospecting in the northwest near Niyaka and Nizato, as well as in the southeast near Sakai. The mining bureau, department of agriculture and commerce, reports an estimate of 70,000,000 tons of ore in Japan, but most of the mines on which these returns are based are not working and probably are not workable commercially.

Mr. Hirahama, a chemical expert in the home department, made some experiments with the earth near Osaka, which revealed a large percentage of oxide of iron (ferro-oxide, 65 to 95 per cent) the best quality of which when mixed with chemicals will yield 66 per cent pure iron by electrical extraction at an estimated cost of $25 a ton. Iwakawa Yosuke of Kobe planned to establish a plant near Kansaki for experimentation with this process to determine cost of production and to enlarge it for commercial output if warranted. This plant has not been developed to a commercial basis, however, up to the present time.

Great wealth flowed into Japan during the four years of the war, due to large profits in shipbuilding and operation and to the marked increase in trade with countries whose markets formerly were not supplied with Japanese products. This wealth, both private and national, now is being used to extend the existing iron and steel plants, to prospect and develop mineral deposits, to build new plants in Japan, Chosen and Manchuria, and to make loans and acquire

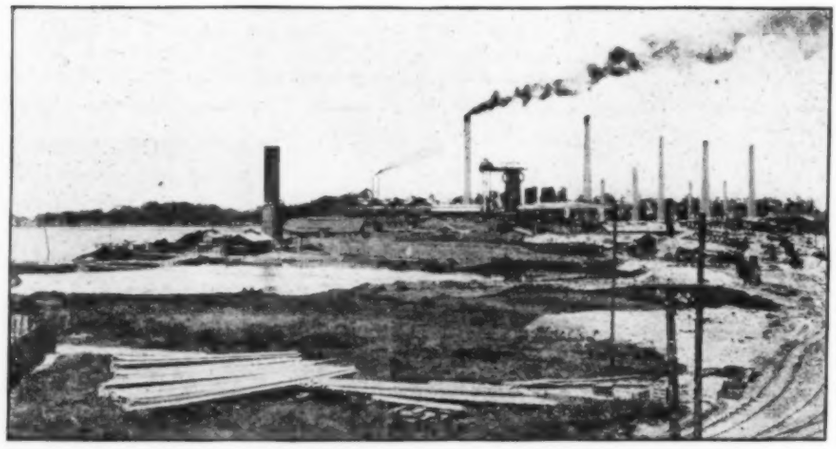
JAMES A. RABBITT, consulting engineer of 192 Broadway, New York, the author of this article, has had an unusual opportunity to study industrial conditions in the Orient during the past 18 years. Mr. Rabbitt was graduated in mechanical engineering from the Rochester Athenaeum Institute, and after a brief experience as an instructor proceeded to Japan in 1902 as manager for F. W. Horne, Osaka. During the Russian-Japanese war, he was engaged in supplying and installing the large gun plant furnished by the Niles-Bement-Pond Co. at Osaka arsenal. After that war he installed power plants and machinery in a number of Japanese works. In 1909 he moved to Yokohama and was given a partnership in the F. W. Horne Co.

He came to the United States in 1910 but returned to Japan in 1911 to become general manager of the Nipponophone Co., manufacturer of tools and novelties. During this connection Mr. Rabbitt took out a number of patents and introduced the Taylor system of scientific management in Japan. In 1917 he established an office as consulting engineer at Tokyo and designed and installed the Fuji Steel Works. He was responsible for the suggestion and installation of a plant for detinning scrap tin plate, and utilizing the base for making cast iron.

In 1918 Mr. Rabbitt returned to the United States and in July he accepted the post of special assistant to the department of state and war trade attache to the American embassy at Tokyo. He submitted an analysis of the tin plate and iron and steel situation in Japan. This report was used as a partial basis for study of the Japanese iron and steel industry by the war trade board.

Mr. Rabbitt in August, 1918, proceeded to Vladivostok to study the economic situation and submitted a weekly bulletin to the secretary of state and the war trade board, which was also used by the peace delegates at Paris. For several months he then acted as commercial attache *ad interim* to the embassy at Tokyo. Returning to America in May, 1919, Mr. Rabbitt resigned his post with the state department. He returned to Japan last month.

interests in various mines, foundries and railroads in China. A loan from the Okura interests to the Moling Kuan mine near Nanking, in 1916, was at first refused by the Chinese government. This finally resulted, however, in the Japanese government taking over the Okura interests and establishing a firm foothold for further expansion in China. Another outlay to the Chinliang-Chien mine near Shantung effected control of another 100,000,000 tons. This mine is on the Tsingtao railroad which since the fall of Kiaochou has been under the direction of the Japanese war office. Should Japan forego the privileges which she has acquired through the Shantung grant in the peace treaty, the loss of this concession would be a serious one to her steel industry.



THE ORIENTAL STEEL CO. AT TOKETA, A NEW JAPANESE STEEL WORKS

A Japanese mission of scientists was sent in 1917 to gage the constant available supply of iron ore in China, officially reported to be richest in the Yangtse river valley, Shantung, Shansi Hunan, Kiangsu and Fukin provinces. China's law nationalizing her iron mines and prohibiting foreign participation in their working was not vigorously enforced and in 1918 the Japanese government formally demanded its repeal. While so far unsuccessful in obtaining her demands Japan seems in nowise to have suffered a check in her program of acquisition. Following this, in the same year, Mr. Nishikara, whose reported connection with the Japanese cabinet lent significance and authority to his actions, was sent to China in the ostensible interests of a group of bankers and other business men. He secured important concessions and arranged loans which gave Japanese capital about 50 per cent control of the iron mines now being worked in China, as well as highly valuable interests in several railroads which are outlets to the already developed mining fields there. The size of the latter resources totals 700,000,000 tons, as estimated by Mr. Kido, chief of the geological investigation bureau of the South Manchuria railway. Dr. H. Foster Bains of the United States bureau of mines estimates there is an additional 400,000,000 tons of iron ore available for modern furnace reduction, and another 300,000,000 tons which might be treated by native methods. Lack of transportation facilities, however, will prevent early opening and operation of these deposits.

In the development of Manchuria, Japan had used the South Manchuria railroad as her vehicle of enterprise, and she has fostered the activities of this company with particular care when they have to do with the production of coal or iron ore or with the manufacture and transportation of metals. This company earned a net profit of nearly $7,500,000 for the year ending June, 1916, and paid $1,250,000 to the Japanese government as dividends on the latter's holdings. In 1917 it placed $600,000 on its budget to cover the initial expense of installing an iron foundry at Lisban, which ultimately will cost $15,000,000. It was estimated that this plant would start operation by the end of 1919.

These are some of the activities that indicate how Japan is reaching out for the constant supply of iron and steel that is to insure her industrial independence.

Must Depend Upon China

Japan is at a disadvantage in the iron industry because of the inadequate output of iron ore. She can, however, use the comparatively accessible output from Chosen and Manchuria and from China, where the resources not only are practically inexhaustible but the quality is greatly superior. The same is true of fuel. Japan's production of coking coal is insufficient to develop her iron and steel industry, but this deficit can be made up by imports from China. Up to the present there has been no development of improved methods of coke production by which the by-products are recovered or by which coke may be obtained from inferior grades of coal. Japan's abundant water power, on the other hand, places her in a most favorable position for the hydroelectric production of iron.

The demand for pig iron in Japan is increasing steadily. It rose from about 60,000 tons in 1903 to nearly 225,000 tons in 1913. At the outbreak of the world war it was 297,000 tons for steelmaking alone and 199,000 tons for general purposes. Both demands were nearly doubled in 1917. Indeed a glance at the growth of pig iron consumption for the last 10 years shows nearly a fourfold increase for steelmaking alone, and nearly a twofold gain for general purposes, or a total demand of nearly 750,000 tons in 1917 as compared with 241,000 tons in 1907.

The demand for steel has shown the same growth yearly. Before the war this was supplied largely by imports. In 1902 only 15 per cent, or 218,000 tons, of the demand was produced in Japan. Later the government-owned Yawata Iron Works began to produce steel, and the home output showed a steady rise until 1909 when it reached 30 per cent of the demand. In 1912 its production over 1902 had nearly trebled. Just before the war, however, Japan's output still was only 33 per cent of her consumption. Then in 1914 both private and official endeavor turned to wrest a new independence against the bitter experiences suffered during the two preceding wars.

Comparison of increases of production and demand shows that the former rose proportionately more than the latter. The steel demand of less than 290,000 tons in 1903 increased to nearly 750,000 tons in 1913. But this was fully covered by the domestic supply at the outbreak of the war. Private and official alertness seized on this point as the base on which the lever of internal effort was to be made to raise the Japanese iron and steel situation to the level of a national industry. The demand slumped sharply through the upheavals of the first two years of the war, and then took a strong upward trend until in 1917 it was 1,182,000 tons. Large though this demand was, it was met in spite of the great difficulty in importing steel.

The slight depression immediately following the outbreak of war unquestionably was due to the sudden stoppage of supplies from England, Germany and Belgium. In 1916, however, the American importations increased to 450,000 tons and these were steadily aug-

Japan's Production and Imports of Iron Ore

In Metric Tons
Prepared from tables compiled by the author

	Kamaishi Mine	Semin Mine	Kuriki Mine	Other Mines	Sand Ore	Total	Imports	Apparent Consumption
1905	70,065	10,076	2,838	19,723	27,964	130,666	97,098	227,764
1906	75,915	11,619	2,558	24,534	31,400	156,026	120,416	276,442
1907	68,473	13,274	2,400	19,896	31,831	135,874	122,654	258,528
1908	75,402	9,728	2,937	20,709	27,740	145,516	190,450	335,966
1909	87,810	6,519	792	14,739	24,798	134,658	187,816	322,474
1910	103,192	4,149	756	5,203	21,756	135,055	244,232	379,287
1911	111,494	4,491	3,472	5,238	21,618	146,313	232,099	378,412
1912	130,471	5,240	3,112	14,360	18,201	171,184	322,017	493,201
1913	136,351	3,869	6,023	6,858	18,600	171,701	422,844	594,545
1914	99,515	6,130	3,668	12,323	14,784	136,420	451,487	587,907
1915	79,572	6,354	3,786	....	.....	.....	511,405	.....

mented until in 1917 they reached 680,000 tons, precisely 10 times the amount of the first year of the war. This would have increased still further had not the United States restricted iron and steel exports. But the demand was increasing by bounds, chiefly from the development of shipbuilding. While the ban on American exports checked Japan's imports, the manifold activity in all of her other industries still further increased the need for iron and steel. Before the war Japan's shipbuilding had to compete with that of more forward-looking nations. The supply of foreign steamships having been abruptly cut off when the conflict broke out, the Japanese production of deadweight tonnage began to increase considerably. It rose from 136,000 tons in 1914, surviving a slump in 1915, and then rapidly went to 450,000 tons in 1917.

Steel Prices Soar in War

The steel required for shipbuilding alone was 200,000 tons, and the mounting demands of other rapidly-expanded industries brought the total requirements up to 1,180,000 tons in 1917, as against the 660,000 tons called for by all industries in 1914. This increased demand, together with the remarkable advance in the price of steel, resulted in a great accession of activity in the iron and steel industries.

The cost of steel in Japan rose from $100 before the war to $600 in 1917, and finished steel products advanced from $75, the prewar price, to $425 in the same period. The steel makers realized extraordinary profits and the opportunity was seized to establish new works and to expand existing plants.

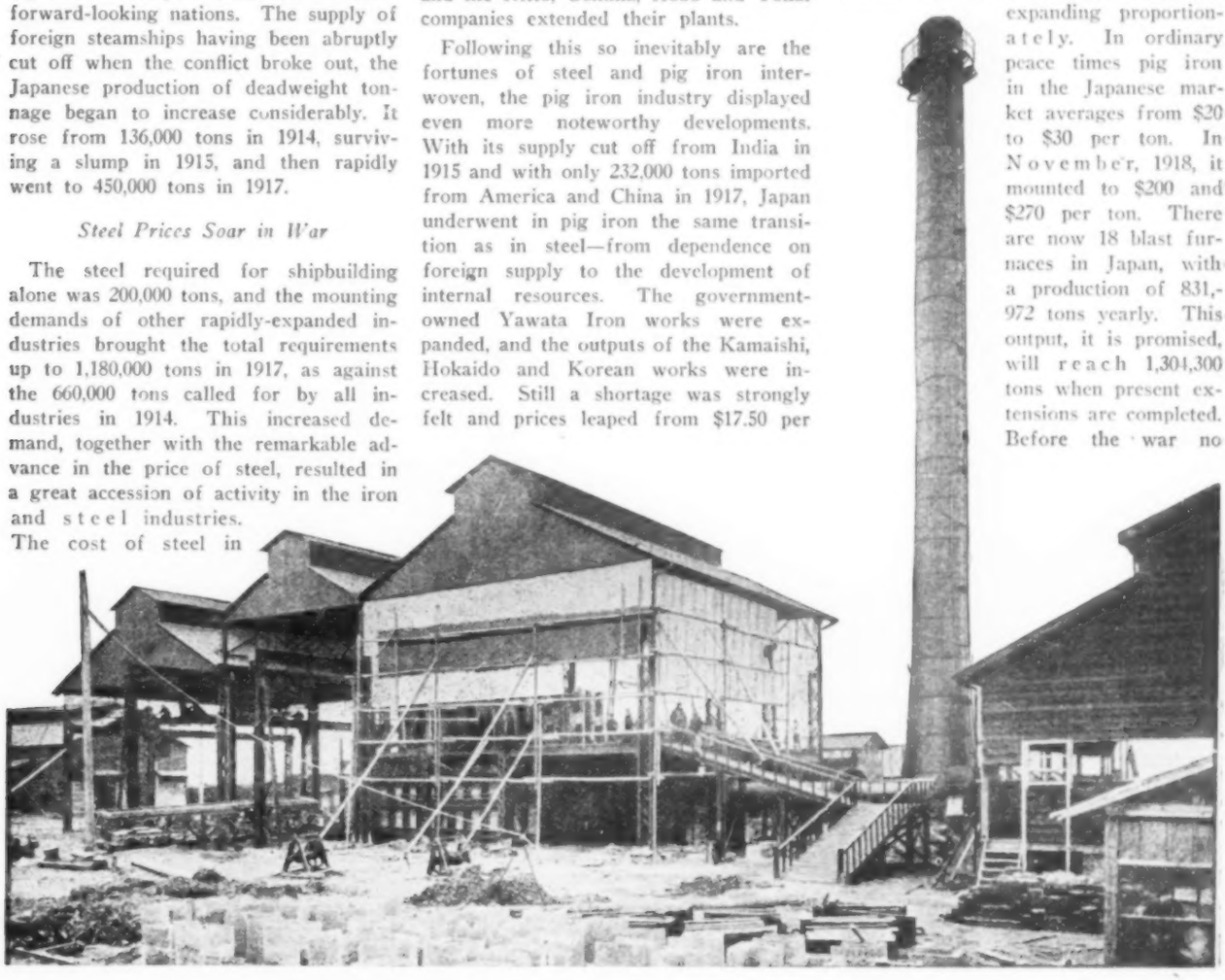
The Japan Steel Tube Co. earned 120 per cent profits, enabling it to enlarge its plant greatly, while paying 50 per cent dividends. All other steel works earned profits ranging from 50 to 60 per cent, and the Nitto, Oshima, Kobo and Tokai companies extended their plants.

Following this so inevitably are the fortunes of steel and pig iron interwoven, the pig iron industry displayed even more noteworthy developments. With its supply cut off from India in 1915 and with only 232,000 tons imported from America and China in 1917, Japan underwent in pig iron the same transition as in steel—from dependence on foreign supply to the development of internal resources. The government-owned Yawata Iron works were expanded, and the outputs of the Kamaishi, Hokaido and Korean works were increased. Still a shortage was strongly felt and prices leaped from $17.50 per ton before the war to $270 per ton in 1918, yielding a profit of $150 per ton to the manufacturers.

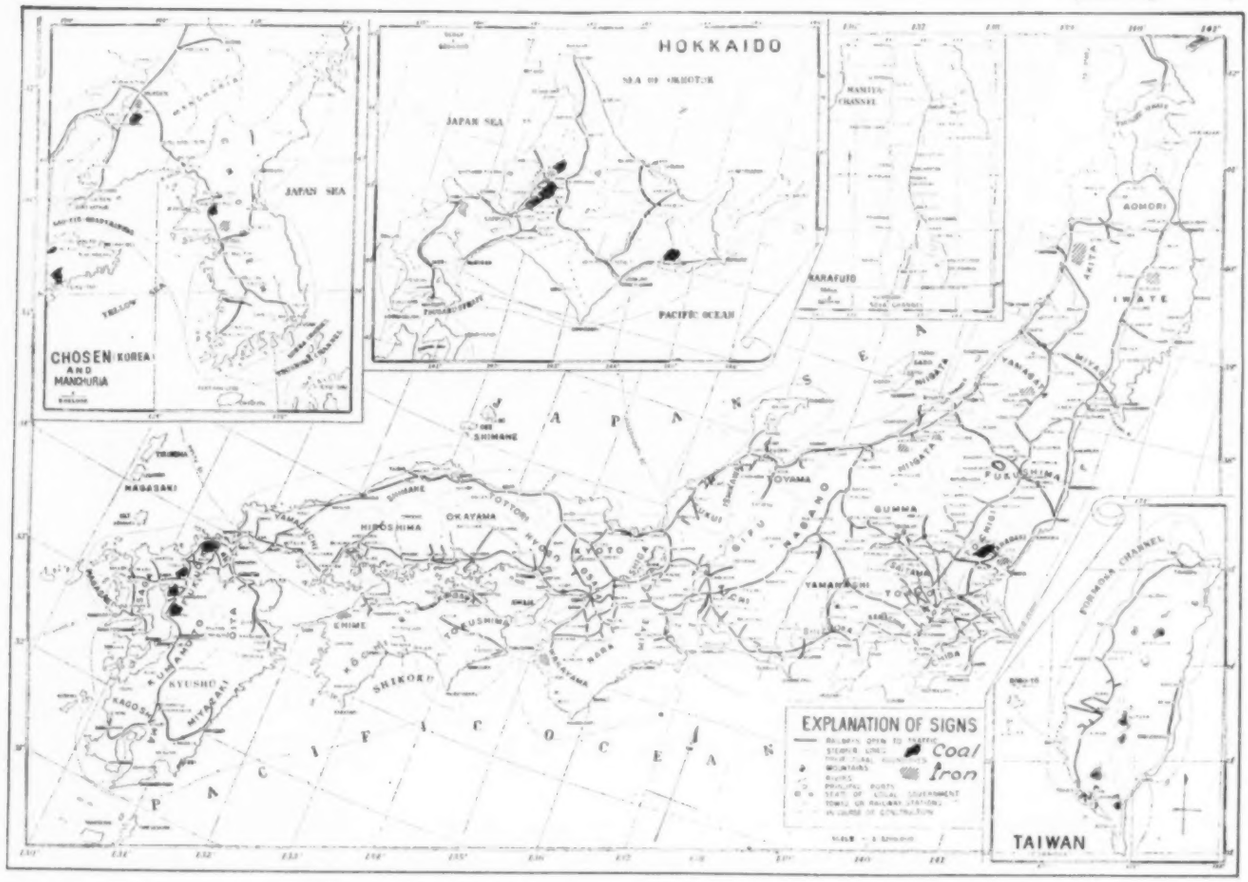
In 1918 the cost of producing iron ore of about 50 per cent quality at the mine was nearly $7.50 per ton. Two tons of ore being required to produce 1 ton of pig iron, the cost, including wages, transportation and two tons of coke, the latter at $25 per ton, approximated $105 per ton of pig iron, netting a profit of $140. Few industries were so profitable as this, and the situation was sufficient to give impetus to industry.

Expect Million Tons in 1920

Taking the steel demand as a gage and based on the growth since 1913, a fair estimate of the Japanese needs in pig iron for 1920 is 1,650,000 tons. Based on the increase of output since 1911 when 191,000 tons were produced, an 800,000-ton output might be estimated for 1920. But with the unprecedented expansion already detailed, it is safe to say that Japan's total output for 1920 will be 1,000,000 tons. The Yawata Iron Works alone will produce about 300,000 tons, and the Sumitomo, the Nitto, the Oshima and the Fuji Steel works are expanding proportionately. In ordinary peace times pig iron in the Japanese market averages from $20 to $30 per ton. In November, 1918, it mounted to $200 and $270 per ton. There are now 18 blast furnaces in Japan, with a production of 831,972 tons yearly. This output, it is promised, will reach 1,304,300 tons when present extensions are completed. Before the war no



THE PLANT OF THE OSAKA IRON WORKS AT OSAKA, JAPAN, IN PROCESS OF CONSTRUCTION



LOCATION OF IRON AND COAL DEPOSITS IN JAPAN, MANCHURIA AND KOREA

steel manufacturer used iron in his operations except the smelted product from iron ore. But with the undersupply of pig iron and the rise in price, the production cost of a ton of steel rose to $400, while the market price for the finished product was $450 to $470. The steel works had to find something cheaper than pig iron, because of the enormous demands and high prices and this has resulted in the creation of a new phase of the industry, the remelting of scrap. These works sent their emissaries throughout the South Sea islands, the Phllippines, even to Hawaii, and purchased all available stocks of scrap iron in these countries. In addition they purchased a very large tonnage of scrap from the Pacific coast. Even sunken ships were broken up.

This mixture at first gave a low grade steel and necessitated the use of more coal. But experiments removed the defect and effected a saving of $50 a ton in melting costs. The steel works at first used only a small proportion but as the quality of the material improved they increased to about 50 per cent. This new industry has brought about a fresh line of thrift in the utilization of waste tin plate. Heretofore regarded worthless, this material advanced from 3 sen per kwamme (8.33 lbs.) to 60 sen, consequent on the discovery of a process for recovering iron from it. This recovered iron cost in 1918 about $117 per ton; the market price was about $147 and the average profit of $30 per ton encouraged the manufacturers to greater effort.

Another outgrowth of Japan's iron and steel demand is the development of the electric production of pig iron. In May, 1918, the Tokyo Denki Seiren Kaisha, at Yodobashi, started the first works of this character in Japan.

The world war has been a great stimulus to the development of all industry and trade in Japan and markedly so in the case of shipping, the iron works and railways. Today Japan stands third among the world's shipbuilders, only America and England being ahead of her. If sufficient iron and steel can be supplied she can launch a 1,600,000 tonnage in steamships each year without further extension. Mechanical equipment and iron and steel products that were imported before the war now are being produced in Japan in sufficient quantities to meet her home demand. Uneasiness has been felt over the possibility that these products may be outclassed by better foreign materials if the latter are imported freely. Both privately and officially a vigorous feeling has grown that Japan must protect her iron, steel and machine works and insure their permanence. Her people are urging a strong protective tariff to cover these years of growth till the new industry shall be securely established.

The influence of the mechanical industry as indispensable to the development of other industries is pointed out by Mr. Okaneto, director of the bureau of commerce and industry, in the Chugai Shogyo, and sums up the situation tersely in seven salient points that cover Japan's economic, political and sociological situation at present:

Shortage and consequent high prices of raw materials.

Small demand for productions of the mechanical industry.

No program in the division of labor.

Difficulty in controlling factories.

Inadequate educational system for workmen.

Inconvenience of monetary circulation.

Lack of ability to undertake organization.

Japan is feeling keenly that first depression after the war, but she is fighting to determinedly tide over the crisis in her economic situation until her ablest minds shall evolve an economic policy that shall stabilize her enterprise and put her whole industrial activity on a solid basis.

Reason to Win Over Radicalism

Full Weight of Public Opinion Being Brought to Bear Against Autocracy in Labor—Short-Sighted Agitators Classed With Enemies of Good Government—Progress Being Made Toward Industrial Peace, Despite Many Strikes

BY A. J. HAIN

WHATEVER changes may be brought about in relations between employers and employes, they must develop in an orderly and lawful manner. Public opinion will not support radicalism as it is generally understood, whether it be concerned with a plot against the government or an attempt at arbitrary suspension of production. These cardinal truths have been demonstrated beyond question by the stirring period in its industrial relations through which the United States has been passing and during which issues of vital importance have been brought to a head. While trade unions have succeeded in defeating efforts to pass laws which would define their responsibilities, the fact stands out strongly that the government holds the whip hand in an extremity, and public opinion will serve to keep within leash the radical minority who would attempt to impose their wishes on the majority.

Extremists whose chief desire is the overthrow of the government will continue to exert a certain amount of influence until the government suppresses them. Agitators who have no interest in common with the workers will persist in their efforts to promote strife and strikes until they are held accountable for their actions, until the public recognizes the harmful effects of loose and libelous utterances against industrial institutions, and the workers learn to distinguish between sound and unsound doctrines. Strikes will occur until means are found to avert them, but the encouraging sign of the times is that the country will not be destroyed to permit an extremely small group of men to try out a false theory of government, or to allow a handful of radical leaders among the trade unions to get revenge on employers for real or fancied wrongs.

All the disorganizing elements combined at work in this country during a period when the public's nerves were the most unsettled, due to economic conditions, failed to obtain the sympathy or support of the public for a program which if carried through would have meant industrial revolution. Laws may be violated with impunity, the courts ignored, and the government overthrown if the great mass of the people are in sympathy with such a movement, but without the weight of public opinion the attempt is futile. The evidence is strong that reason will prevail, and that is the point of most importance to the employers and employes who sincerely wish to reach an understanding and establish friendly relations.

While fear of industrial revolution is lurking at this time in the minds of many persons who believe danger will not be wholly removed until the coal miners, trainmen and steelworkers are satisfied, the public's indorsement of the government's action in regard to the miners, and the decision of the miners' officers to obey the court should go a long way in dispelling that fear. It is true that when peace is declared the government will not have the Lever act with which to control those who would conspire to restrict production of the necessities of life, but the issue involving peace or war was drawn so sharply in the case at Indianapolis that the will of the majority could not be misunderstood. The Lever act served a greater purpose in directing public thought on this issue and crystallizing public opinion than it did in forcing the resumption of the production of coal.

The success of the government in enforcing the Lever act may rekindle the desire in some quarters for a law opposed to the arbitrary interruption of the forces of production. If a strike can be abolished so effectively while the country technically is at war, why not continue the law for the same purpose in times of peace? The answer is that it is not an effective means for overcoming a strike, and it is fraught with danger. Union leaders may be enjoined from directing a strike and strike benefits may be cut off, but men cannot be compelled to work. Further, if strikers

THE OPENING SESSION OF THE NEW INDUSTRIAL CONFERENCE IN WASHINGTON

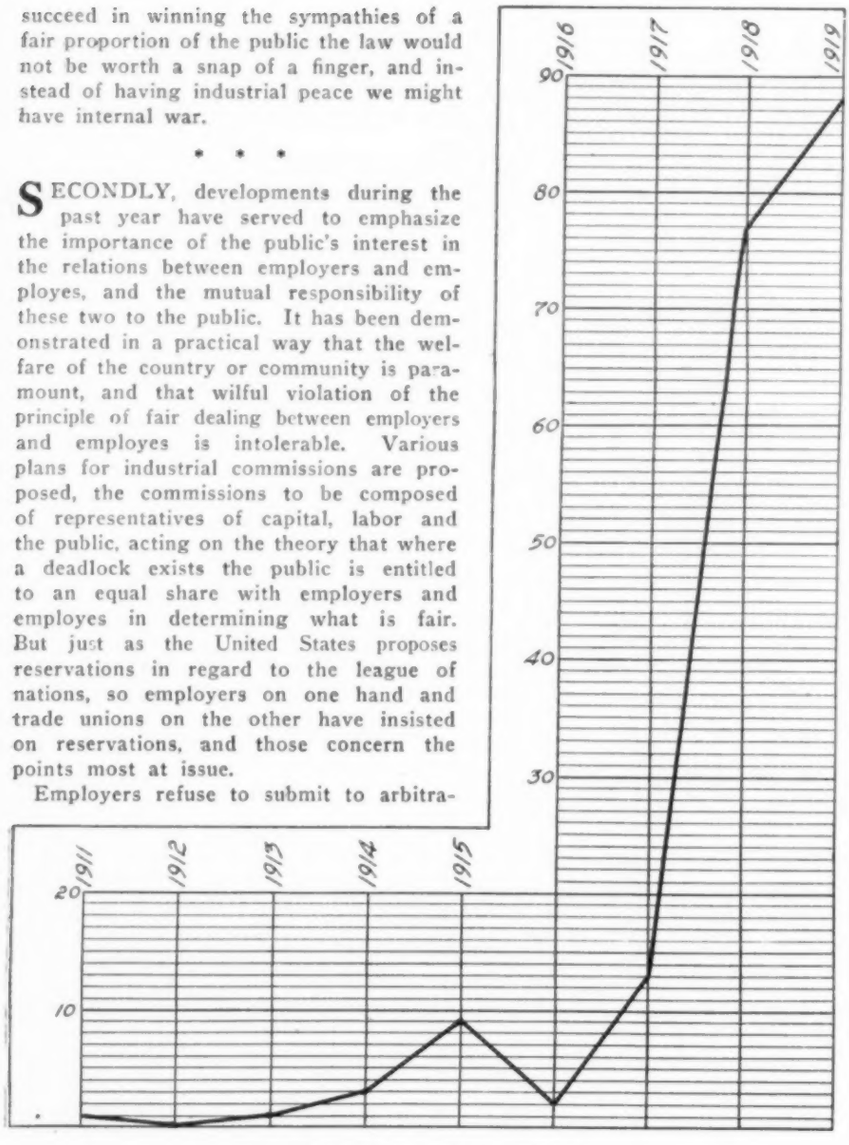
Left to right, seated, Julius Rosenwald, Henry C. Stuart, Samuel W. McCall, Thomas W. Gregory, Stanley King, and William B. Wilson. Standing, Henry J. Waters, Martin H. Glynn, Rickard Hooker (above) Herbert Hoover, W. O. Thompson, Oscar Straus, George W. Wickersham, Henry M. Robinson, Prof. Frank W. Taussig and Owen D. Young

succeed in winning the sympathies of a fair proportion of the public the law would not be worth a snap of a finger, and instead of having industrial peace we might have internal war.

* * *

SECONDLY, developments during the past year have served to emphasize the importance of the public's interest in the relations between employers and employes, and the mutual responsibility of these two to the public. It has been demonstrated in a practical way that the welfare of the country or community is paramount, and that wilful violation of the principle of fair dealing between employers and employes is intolerable. Various plans for industrial commissions are proposed, the commissions to be composed of representatives of capital, labor and the public, acting on the theory that where a deadlock exists the public is entitled to an equal share with employers and employes in determining what is fair. But just as the United States proposes reservations in regard to the league of nations, so employers on one hand and trade unions on the other have insisted on reservations, and those concern the points most at issue.

Employers refuse to submit to arbitration the principle of the open shop, although if submitted to a representative body of Americans it probably would be upheld; and trades unions will not surrender their weapon, the strike. There can be no disagreement with the statement of employers that they are entitled to employ whomever they desire, and that they may bargain with those employes collectively through shop committees, through trade unions or deal with them as individuals. There is little doubt but that they are reinforced by public opinion in their contention that the open shop squares with ideals of Americanism.



GROWTH OF EMPLOYE REPRESENTATION

Showing the number of new works councils of various types put in operation each year since 1911. The date of the origin of 17 others is not on record

In regard to trade unions, the point at issue is not their right to exist. They would be justified in refusing to submit that right to arbitration, as well as the employers are justified in refusing to submit their right to maintain the open shop; an adverse decision in either case would be equivalent to an invasion of their constitutional right. The point is whether trade unions in collective action, seeking the advantages which may be derived from collective bargaining will agree to assume collective responsibility. They cannot agree to that and retain their weapon, the strike, to be used in the event they should lose through arbitration. It is their failure to assume collective responsibility and their refusal to be bound by decisions that has stood in the way of successful arbitration. Organized labor is on record as reserving the right to strike under any circumstances when in its own opinion the strike is justified. "The public be damned" does not express the attitude of "the capitalistic class" today, but it does represent the position taken by trade unions in clinging to the strike. Eventually public opinion will assert itself more strongly on this point, and trade unions will agree to submit their claims to arbitration before they strike, and they will agree to be bound by the decision of the majority. This does not mean "serfdom" for labor, it means a step toward the abolishment of autocratic rule in industry.

* * *

ANOTHER development of significance during the past year is the loss of prestige sustained by the American Federation of Labor. At the conclusion of the war and for several months thereafter, the federation had the respect and confidence of a large proportion of the people; it was generally given credit for being loyal to the country during the war and for standing as a barrier against destructive influences. Within a year it has lost this good reputation and become the object of suspicion and distrust. Some of its leaders who are influential in shaping its policies are condemned as the enemies of good government and the most radical exponents of industrial warfare.

The police strike, coal strike, steel strike and other strikes called in opposition to the highest authorities and against the better judgment of the people have served to arouse public sentiment, and defeat the purposes of the strike leaders. The federation would be utterly discredited were it not for the good will it obtained during the war, and the thought in the minds of many people that an organization which proved helpful in such a critical period cannot be wholly bad.

And what happened during the war? Employers, striving to the limit of their ability to produce war material, either voluntarily, or through decisions of the war labor board conceded practically every demand made by trade unions. Most of the concessions were made voluntarily, and they were made not only to members of trade unions but to other workers as well. By granting substantially all that the representatives of trade unions asked, the employers maintained peace at home in order that the armies might be well supplied. Despite the fact that the government contracts were under close scrutiny and the prices of some basic commodities were limited by law, and notwithstanding that demands of the unions were met, their leaders persistently sought to promote discontent. The high cost of the necessities of life against which they now complain and on which they base claims for

higher wages are due in a large measure to the fact that they seized the opportunity to force up wages when the cost of living was comparatively low. The 37,000,000 unorganized workers want to reflect on this influence of trade unions on their lives. The remedy for their ills does not lie in joining the trade unions, but in taking a stand against the arbitrary demands of an organized minority which is serving to place a serious burden on all.

* * *

MUCH progress was made during the year toward industrial peace, regardless of the many bitter strifes. While the first national industrial conference called by President Wilson failed to reconcile two conflicting elements, it clarified the issue between capital and labor on collective bargaining and the closed shop. By giving the public a clear understanding of the position of employers and that of the trade unions, as well as the interest the unorganized majority of workers have in the matter, it undoubtedly hastened the day when the truth will be perceived and the question settled in accordance with the principles of Americanism.

The majority of employers do not oppose collective bargaining, if by that is meant mutual consideration of their problems and the recognition of certain principles affecting their relationship. Many of them do not oppose dealing with their men in the mass, and by such means fixing wages and hours of work in certain lines where work performed by the individual is of a general nature. Some of them would not object to the same means being taken to adjust wages and hours even where output and efficiency varied widely, granting this concession if employes demanded, although recognizing that a fixed wage for a group of workers is an unscientific way of paying. It is probable that some employers would consent to deal with representatives selected by their employes outside of their own personnel, if they were not required to deal with representatives of trade unions, and by so doing in effect recognize the trade union. Employers have an open mind in regard to the meaning and scope of collective bargaining, except that they cannot deal with trade unions.

On this point the leaders of the trade unions say that men having grievances cannot always express them to their fullest advantage, and that they, the labor leaders, should be permitted to speak for them. That is equivalent to saying that because a city or a state does not have within its borders men of sufficient intelligence to express their views and represent their constituents as those outside would like to have them represented, the people of the city or state should refuse to be represented except by those who want the job. Intelligence does not vary so widely that a group of employes does not have one or more men within it of sufficient mentality to express its decisions. What the leaders of the trade unions want is permission to invent grievances for the men, not merely to express their desires. If the workers themselves are satisfied, why should the labor leaders be permitted to "represent" them with fictitious demands? If the workers in plants where collective bargaining is established find they cannot maintain themselves in accordance with the "American standard of living" they may instruct their representatives to demand readjustment of wages and hours, and if they fail to obtain satisfaction they may appeal to the public and demand arbitration.

But what of the industries wherein there are no "company unions," no means established for the men to express themselves in the mass? The trade unions ask if the workers in those interests must be abandoned to the mercies of employers. They say that while the men may have cause for grievance, if one should endeavor to express it he would be dismissed, and therefore there is need for the trade union organizer.

The employers' answer, is there any considerable number among them today who are so unconscious of the spirit of the times as not to provide means for their employes to express themselves? What employer would deny his workers the right to discuss their conditions of employment or refuse to meet them and discuss with them those conditions? While clearly defined methods for discussion and representation are not established in the majority of industrial plants, employers more than any other class recognize the advantage and desirability of counseling with their men and maintaining friendly, open relations with them. This spirit has taken hold of them to such an extent that the day may come when all employes will be compelled to join and participate in "company unions" in order that there may be no misunderstanding as to their right to express themselves.

In the light of recent experience, the most absurd of all the trade unions' demands is that "company unions" be abolished; that the concrete expression of friendly relations between employers and employes be wiped out. On matters most vitally affecting employes, the leaders of trade unions want no contract between employers and employes except that which may be established through them. Their position indicates that if the employers were to offer company unions the right to have "representatives of their own choosing," stipulating that the choice must lie between men of known integrity and responsibility and not identified with labor unions, the leaders would object.

In the report of the senate committee which investigated the steel strike it was stated that the chairman of the United States Steel Corp. could not be critisized for refusing to receive a committee of which William Z. Foster was a member. It declared that if Foster and others of his type had at heart the best interests of the workers they would withdraw from the organization. Foster still claims to represent the organized steelworkers, but would they vote for Foster to represent them knowing that he prejudiced their cause?

Foster may be said to be an exception among leaders of trade unions, but his views were well known to them and he was not repudiated, a fact which disqualifies those who uphold him. In this case, the motives of "the business manager of the steel strike," as the senate committee described Foster, were known, and the public could be apprised and protected against him, but the public does not obtain such a clear insight into the character and motives of others who purport to speak for the workers and it must assume that an organization that will sponsor one Foster will sponsor others.

* * *

PROBABLY the greatest progress made during the year toward peaceful settlement of industrial disputes was brought about by the employers themselves in the organization of their men in works councils and associations providing for employe representation. Industrial commissions for the settlement of disputes may avert strikes, but they do not reach the cause of the trouble, and employers recognizing that fact are proceeding to work out the problem in logical order. First, they have accepted as an established principle that they must be fair to employes, and, second, they must convince employes that they are fair. It is an easier matter to determine the value of the services of an employe and to be fair and even generous with

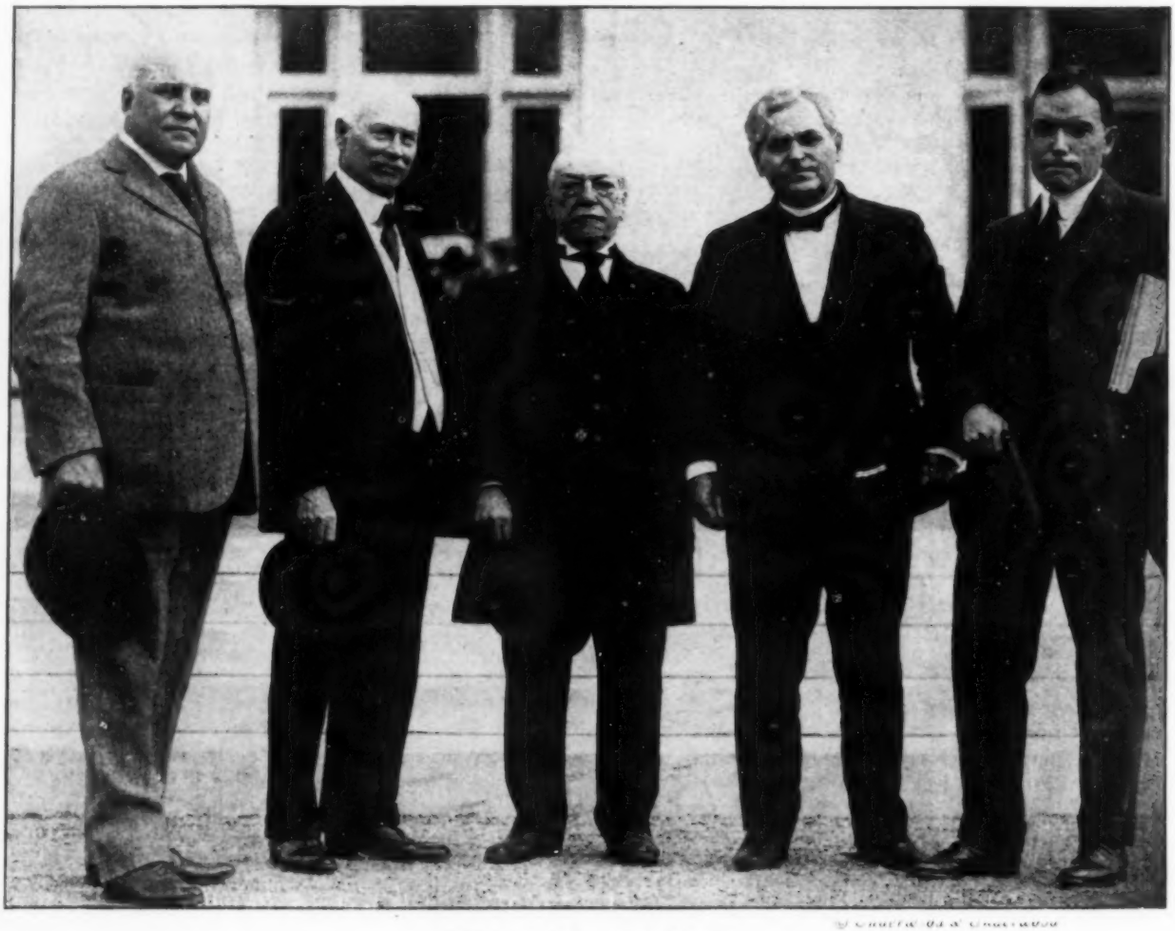
him than it is to change his mind when he has a wrong impression.

Reports of enormous earnings, large dividends and the corraling of wealth in the hands of a few men, on one side, and the cost of food and clothes on the other, have served to implant in the mind of an honest worker suspicion that he is not receiving his just deserts, and sometimes he is inclined to heed the voice of the agitator. He may be swayed to act impulsively, not knowing whether he is right or wrong, but lured on by the promise of money.

The purpose of employe representation worked out to its fullest extent is not to persuade him that he is well paid when he is poorly paid, and that he has an easy time of it when he knows he is laboring hard, but to afford him a better opportunity to judge for himself. Trade unionism does not afford him any such opportunity. Was ever an attempt made by a trade union to determine on a scientific basis, as many employers are doing, how much a man's services are worth? Has a trade union ever held a meeting for the purpose of considering problems of production? On what do they base a demand for $1 an hour when a man is getting 90 cents?

How far the trade unions are from the mark in this respect is well illustrated in the case of the steel strike. The demand in regard to wages as presented in their 12 points for perusal by the public was vague, that is, to permit the workers to live in accordance with "the American standard of living." In every open meeting attended by the writer the strikers were told that as compared with others "in this free land" they were starving, their wives and children were starving; that they were entitled to better clothes. The senate committee which investigated the strike went into the Pittsburgh district and examined many witnesses, then went into the working districts where the men live, and unanimously reported that the wages paid the steelworkers were satisfactory and that complaint on that score was without a foundation.

Nor was the finding based on the opinion that whereas most of the strikers were foreigners they were not entitled to the American standard. The significant part of it was that foreign-born workers, including a majority not naturalized, were paid wages enabling them to support themselves as comfortably as the average Americans, and yet were willing to be led by organizers who held out the promise of more money. The report showed that the organizers are not equipped either by training or temperament to guide the workers either in formulating or presenting their demands. The officers and organizers of trade unions do not attempt to act in a constructive capacity, and the only appeal they can consistently make is destructive in its influence. It is a case of badgering the employers, and either wilfully or unwilfully deceiving the employes. Class agitation thus operating in the dark can no more find sympathy in the hearts of the great majority of Americans



TALKING IT OVER AT WASHINGTON

Secretary of the Interior Franklin K. Lane, secretary of the first industrial conference, E. H. Gary, Samuel Gompers, Frank Morrison and John D. Rockefeller, Jr., at the first conference in Washington

THE FIRST INDUSTRIAL CONFERENCE SERVED A USEFUL PURPOSE IN CLARIFYING THE ISSUES BETWEEN CAPITAL AND LABOR

than can the blind prejudice of the avowed enemies of the government.

* * *

FAR from proving that employe representation in the iron and steel industry is impractical, the strike demonstrated that it has strong points that appeal to employers and employes alike, for had it not been for the steadying influence of representation the strike in some instances might have been more severe. Of comparatively recent origin, and in some plants not fully developed, the plan was put to the strongest test, and the experience of most of the companies convinced them that it should be continued and made more effective by the Americanization and education of the workers.

A survey of the operations of works councils including the various forms of employe representation was made by the National Industrial Conference board, Boston, and embraced 225 councils in 176 different industries. More works councils are found in the metal trades than in other industries, the number being 144 as compared with 81. Forty-one are in operation in plants devoted to the manufacture of machinery and appliances, 20 in iron and steel mills; 14 in sheet metal, wire and wire-products plants; 15 in toolmaking shops and 12 in plants manufacturing machine parts. Plants having works councils employ approximately 500,000 workers.

"Ultimate settlement of matters failing of adjustment by the works council is provided for by compulsory arbitration in only a small minority of establishments," the industrial board reports. A smaller number of plans, effective, however, in over twice as many establishments provide for final submission to arbitration if the parties at the time agree thereto. Ultimate power of settlement rests with officials or the board of directors of the company in only a few cases. The plan in effect in a majority of establishments make no provision for further reference after the works councils has failed to reach an agreement.

While arbitration is provided for by the employe representation plans in effect in a number of establishments, in only one industry have employes been allowed to call in the assistance of an outside representative. Under the Shipbuilding Labor Adjustment board plan the craft committee first seeks an adjustment with the foreman. Failing in this the committee may then take up the matter with the superintendent. If the grievance concerns more than one craft it is handled through a joint shop committee, first with the superintendent, then, failing a settlement, with the higher officials of the company. It is especially provided that in any conference the craft committee or joint shop committee may be assisted by a representative of its own choice. In case the conference fails to result in a satisfactory adjustment it is provided the grievance be submitted to a district examiner of the shipbuilding labor board.

Of the total of 225 works councils covered in the conference board's survey 145 are expressly reported as concerning themselves with one or the other of the questions of remuneration and hours of work. Of this number 72 were instituted on the initiative of the employers, 56 by the national war labor board and 17 by the shipbuilding labor adjustment board. Only eight of the 225 are of the government type, that is, having a house and senate, the others being of the committee type.

"In most cases," the board's survey discloses, "works councils are reported as having produced favorable results, although in a number of instances, chiefly of national war labor board committees they have apparently accomplished little or no good. In a few cases their introduction tended even to aggravate labor difficulties. But on the whole they appear to have produced some benefit."

Of 150 works councils reported on in detail it appears that 16 have lapsed entirely and several others have had only a perfunctory existence. "Aside from one shipbuilding labor adjustment board committee and three councils voluntarily introduced by employers all of those which have lapsed were national war labor board committees," the report states. The inference from the survey is that the most satisfactory results have been obtained in those cases where neither the employers nor employes were acting under compulsion, but were actuated by a co-operative spirit.

* * *

THE most comprehensive plan for an industrial commission submitted to the first national industrial conference, that proposed by Secretary of Labor Wilson, provides for a board in each of the principal industries, and one representing miscellaneous industries, not otherwise provided for. Such "locals" as they are designated are to be composed of an equal number of representatives of the employers and em-

ployes of the industry in general. Decisions on questions of wages, hours or working conditions must be unanimous. If the local fails to reach an unanimous agreement the matter in dispute is referred to a general board, composed of an equal number of representatives of employes in the industry, employes and appointees of the President of the United States. If the general board fails to reach a unanimous decision the question is submitted to an umpire selected by unanimous choice of the board, or else by lot from a standing list of 20 persons named by the President. A decision by the umpire shall be considered as binding on both parties to the dispute. The plan further provides that either side may be represented before the local, general board or umpire by counsel of its own choice.

In England the ministry of labor has purposed a bill providmg for an industrial court and courts of inquiry to examine into labor disputes. Decision by the industrial court would be binding, although parties to the dispute would not be compelled to submit the case to the court. In the plan proposed by Secretary Wilson, the local board could take jurisdiction whenever in the judgment of one-half of its members a strike or lockout is imminent. These plans represent latest thought in the United States and Great Britain in regard to industrial commissions or courts.

Trade unionism in England has had a more remarkable growth than in the United States. The membership in the British trade union congress before the war was 2,232,446. Last year it was 4,532,085 and in September of this year it had increased to 4,895,954, while the American Federation of Labor is generally rated as having 3,000,000 bona fide members and its own officers claim but 4,000,000. The growth of the British congress is due to the amalgamation of many labor bodies and societies, which previous to the war were independent of it, while in this country the federation has obtained some additional membership from the Socialist party. Before the war the party claimed a membership of 117,000, while according to a report read at the convention of the party in Chicago recently it now includes but 42,217. With this party's candidate for president in the penitentiary for sedition, its representative refused admission by congress, and a host of perennial candidates for lesser offices either in jail or under indictment for the part they took in the war its influence as a factor in the labor situation has been destroyed.

Many of its radical insurgents are now to be found among the Industrial Workers of the World, and the Industrial Workers are claiming a larger membership than the federation. The industrial workers and their allies, the radical socialists and the bolshevists claim 10 per cent of the working people of Cincinnati, 33 per cent of those in Toledo, 41 per cent in Cleveland and 34 per cent of Detroit, and a large number of those in the west and northwest, a total of more than 5,000,000 in the United States. The line of demarcation between the "red wing" of the federation and the Industrial Workers is less pronounced than at any previous time, and there are now evidences of internal strife within the federation whereby the most radical elements, sympathizing with views of the Industrial Workers, syndicalists and bolshevists, are seeking to gain control of that body. It is claimed that the principle governing the federation, arbitrary action based on misinformation, or meager information regarding conditions which it seeks to correct, its tendency to promote insubordination and restrict production, make it a fertile field in which the most radical elements in the country may flourish. Granting the membership claims of the I. W. W. and their kindred and the American federation the total would amount to approximately 10,000,000 of the 37,000,000 workers in the United States.

* * *

ONE of the most important incidents of the year as regards the labor situation in the iron and steel industry was the pronouncement by the senate committee which investigated the strike that wages paid are satisfactory. Other investigations undertaken for the purpose of comparing wages and the cost of living and their respective advances during the past few years bear out the conclusions of the committee. The average weekly earnings of employes in the metal industries increased 88 per cent, and the average hourly earnings 74 per cent, while the cost of living increased but 61.3 per cent from the middle of 1914 to March, 1919. The weekly wages have increased 27.3 per cent more than the cost of living. In the eight leading industries of the country hourly earnings increased from 74 to 112 per cent, while the increase in weekly wages was from 62 to 110 per cent.

Some months ago, before the epidemic of strikes, impartial observers believed that the cost of living would come down much faster than wages, but while employes strike to obtain shorter hours with less production we might expect the reverse to be true. The maximum amount of wages together with the maximum amount of leisure cannot reduce cost of food and clothes to the minimum. Somewhere there is the golden mean, but the scales cannot be made to balance by means of the strike.

A great number of employers have sought to work out methods for sharing profits with employes as the simplest and most direct means for satisfying them as well as to impress on them the fact that they have an interest in the enterprise. The most ambitious profit-sharing plan inaugurated during the past year failed because of the feeling among the men that they were not getting a fair share of the profits, but in many other notable instances profit sharing is in successful operation. The difficulty in the way of working out a profit-sharing plan against which there can be no complaint is much the same as encountered in the fixing of wages. Wages were generally based on "what the other fellow" had to pay, as determined by the law of supply and demand. That law is not adhered to strictly in these days, although as the result of its operation in the past and the influence of trade unions, there is a uniformity of wages in some industries wherein companies are not on the same basis as regards earnings.

While the law of supply and demand is sleeping trade unions are seeking to perpetuate one of its worst features and keep men and wages on a dead level. Trade unions cannot consistently demand "fair wages" and like wages for every man in a craft, for it is unfair to pay all men similar wages when they are not similar in capacity. Theoretically, according to the trade unions, each man in a class is satisfied in knowing that he receives as much as his fellow worker, and this tends to simplify the matter and allay unrest. If any group of men want to bind themselves to such an arrangement, of course, they cannot be denied the right, but here is the reaction: One man in that group will be inferior to the others. His superiors will slow up, feeling that the inferior man is being paid as much as they. This will work all the way down, until the entire group has reduced itself to the capacity of the most inferior of the lot. And if they are to be paid a "fair wage," in accordance with their own demands, the wage must likewise fall to the low level. Experience outweighs against theory that the competent man will make up for the incompetent, and therefore an average may be established. The fact is that if the trade unions could foist the "dead-level" system on all the workers of the country initiative would be dead, and the workers would indeed be "serfs."

* * *

WHILE the government recently rounded up several hundred anarchists and finally deported them, congress has given more attention to

the problem of Americanization of the aliens among whom these disciples of discord were most active, and employers of foreign-born workers have redoubled their efforts to Americanize and educate the latter. Congress is attempting to do on a national scale what many of the employers have done for years in maintaining and encouraging schools for foreigners. Employers who have recognized their responsibility in this matter and the importance of their situation have sought to equip aliens for citizenship, although in many instances it has proved to be a difficult task because of suspicion aroused in the minds of the aliens that their education was undertaken primarily for the benefit of the employers.

Experience has shown that any effort congress makes to promote Americanization and education will be rendered more or less futile in proportion to the degree of license allowed the agitators who oppose both Americanization and education. A bill now pending before congress proposes the expenditure of nearly $50,000,000 by the federal government to provide for the education of foreigners and their children. The proper expenditure of such a sum no doubt will go far toward counteracting the influences of the agitators, but it would go twice or thrice as far, if in conjunction therewith the government would suppress the many thousands of foreign radicals whose efforts are opposed to such a campaign. The rounding up of a few hundred "reds" in a spasmodic effort to satisfy the demands of an aroused public does not meet the situation. One large company in the iron and steel industry which made a special effort to Americanize, educate and train its workers suffered the most severely at their hands because hundreds of agitators were permitted to work among them, making statements which were proved by a public investigation to be false.

The chief of the foreign language division of the United States treasury estimates that there are in the United States 15,000,000 who were born in foreign countries and over 14,000,000 who are the children of the foreign-born. Of these 29,000,000, he says, more than 50 per cent speak and read either exclusively or preferably the tongue of the country of their origin, in the aggregate conversing in at least 47 different tongues.

Senator Kenyon's Americanization bill which has been reported to the senate and which is considered the most important and comprehensive of the Americanization bills before congress appropriates $5,000,000 for the fiscal year ending June 30, 1920, and $12,000,000 annually until the end of the fiscal year, June 30, 1923, and additional sums equal to the balance unexpended of the appropriation for the last preceding fiscal year. The bill aims to encourage the states to adopt compulsory teaching for those who cannot speak, read or write the English language. The money appropriated would be allotted to the states in that proportion the number of foreign-born illiterates bears to the total in the United States. It would be necessary for the states to provide for the teaching of English for at least 200 hours per annum for aliens 16 years of age or over and under 45. Senator Kenyon estimates that there are 8,000,000 persons in the United States over 10 years of age who cannot speak the English language.

Under normal conditions as regards immigration the United States would collect a head tax of $7,000,000 annually from aliens entering our ports. A head tax of $8 is collected from each alien as he enters; $1 for his declaration to become a citizen and $4 for each certificate issued. The last appropriation made by congress to aid in Americanizing aliens amounted to but $450,000, a fact which prompted one congressman to declare that the United States is "one of the greatest profiteers in dealing with our alien population."

Free day and night schools supported wholly or in part and conducted in co-

AMERICANIZATION CLASS AT THE CHICAGO WORKS OF THE NATIONAL MALLEABLE CASTINGS CO.

operation with local school officials are to be found in most of the industrial districts having large numbers of foreign-born workers. Education is not offered in place of adequate remuneration and fair working conditions, as the trade union organizers have told the men, and if it were so intended it would defeat that purpose quicker than any other means which might be devised. The existence of the schools is an evidence that those who support them want the enlightened judgment which comes from an understanding of Americanism as distinguished from syndicalism and bolshevism. Nor are the efforts of the large iron and steel companies in seeking to Americanize their workers limited to the establishment of schools. What is of equal if not greater importance is the building of good homes and the sale of homes on terms within the means of aliens, to stimulate their desire to become Americans.

In addition to formulating a plan for the education of illiterates, congress has voted to exclude undesirables by extending the government's power to limit the issuance of passports. Many other bills are before congress reflecting the public's views with regard to the activities of agitators, although the opinion is general that what the country needs is not more laws but a more energetic enforcement of those it has. One of the bills receiving attention proposes to make it unlawful for any one to advocate the overthrow of the government, to display in public any emblem which symbolizes the overthrow of the government or to use the mails for a similar purpose. Final action has not been taken on any of the measures proposed for the suspension of immigration. While Attorney General Palmer has been urging on congress the necessity of passing additional laws to give him more power to deal with the 80,000 "reds" and radicals he says are active in the United States, the house committee on immigration recently began an investigation to determine why government departments failed to rid the country of those agitators over whom they had control. This action promptly brought results, approximately 250 of the "reds" who had been held for some time at Chicago, Pittsburgh and other large cities, being rushed to New York and put aboard ship. These were but a handful of the radicals swarming in the industrial districts of the country, and the public is eager to know when the second ship will be sailing. The government accomplished this so readily when pressure was brought to bear through its representatives, that it is believed much more can be done.

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THE record of the year is a warning to trade unions to adopt a more conservative policy and to submit to government control, lest the public cease to have patience with them and they lose much of the ground they have won.

The first industrial conference failed because the trade unions would not recognize the legitimacy of the open shop, a point on which they are overwhelmingly overruled by the press and the public. President Wilson had scarcely named the members of the new industrial conference before officials of the American federation gave out statements declaring "big business" dominates the personnel and that organized labor will not receive a fair deal. Before the conferees began work, before there was any reason to suspect that there would be anything else but an unbiased judgment on problems affecting capital and labor, the leaders of the trade union sulked and complained that the cards were stacked against them, a display of temper against the man who in the past has done more than any other to earn their gratitude.

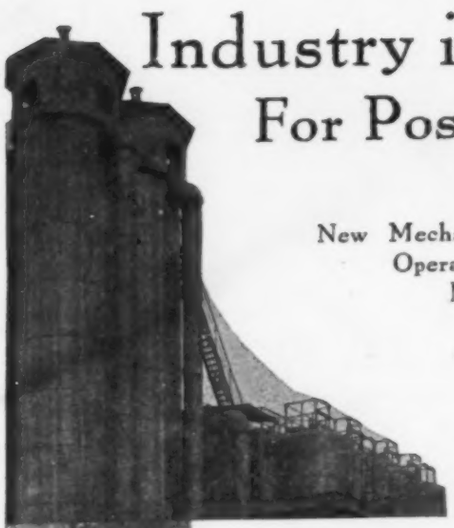
Another indication that many of those who now proclaim themselves union leaders have not learned their lesson is to be found in the platform of the new labor party organized in Chicago in November, apparently to take the place of the socialist party. Labor does not vote as a party, judging by events of the past, and therefore this attempt will fail of the purpose outlined by the organizers, but it is interesting for the fact that it presents a platform on which no American can stand. It proposes the release of all "political prisoners", one of the chief demands of the I. W. W. It proposes that this country adopt a more friendly course toward the bolsheviks of Russia, which is nothing but an attempt to win the support of the "reds." It proposes to repeal of the only laws which the government has found effective in dealing with the enemies of the government, and it demands the impeachment of United States District Judge Anderson for issuing an injunction against the coal miners' officials. This platform may be successful in cementing the ties between the radicals of organized labor and the Industrial Workers of the World, but it does not present a single plank which will appeal to the honest American worker.

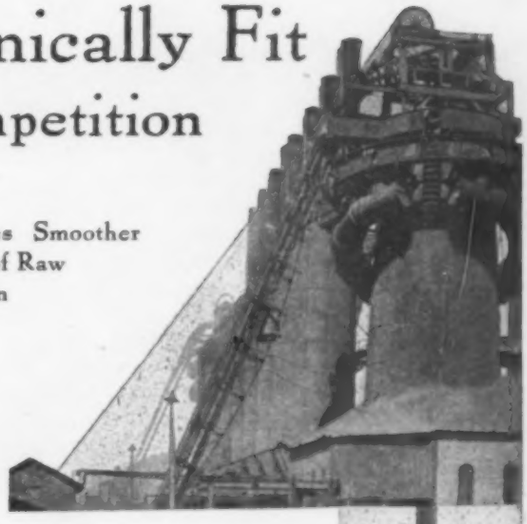
Far from frightening the employers and the public such acts on the part of the radical labor element should reassure them. The more radical labor becomes the swifter and surer will be its rebuke.

LIKE GULLIVER AND THE LILIPUTIANS

Will the great body of 37,000,000 independent workers be bound down and made helpless by rules and regulations formulated by leaders of 3,000,000 trade unionists?

Industry is Mechanically Fit For Post-War Competition





New Mechanical Equipment Insures Smoother Operation, More Efficient Use of Raw Materials and Conservation of Man Power

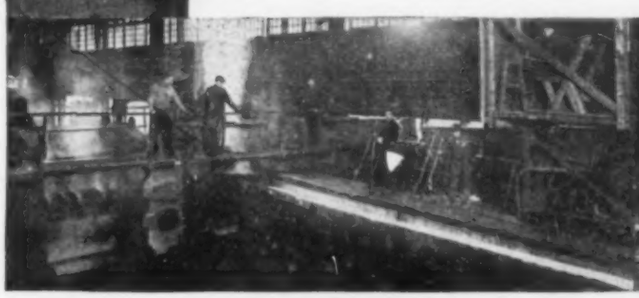
BY E. L. SHANER

NO SOONER had the tidings of victory swept through the offices and plants of America's war-keyed industries than engineers and works managers began to plan for reconstruction. For more than a year, the energies so abruptly withdrawn from the service of Mars have been devoted to reorganizing the country's manufacturing resources to meet the new requirements of peace-time competition.

So bewildering and complex were the conditions unfolded with kaleidoscopic rapidity during the past year that few, if any, of even the best informed authorities were able to foresee them far enough in advance to prepare for the many contingencies that followed. The expected improvement in the supply of workmen did not materialize, even after the army and navy were reduced almost to their normal quotas. The cancellation of government contracts and the dumping of war stocks did not relieve the demand for materials to the extent anticipated. Instead of being satisfied with the wonderful progress made during the war, labor put forth additional and unprecedented claims, meanwhile interrupting production upon every conceivable pretext. Moreover, these disturbing factors were accompanied by an epidemic of high prices which has spread to practically every essential product except iron and steel.

In spite of the serious conditions confronting business on all sides, the iron and steel industry is weathering the storm of unrest with characteristic equanimity. This is especially true in regard to the status of its mechanical equipment. Although less than 14 months ago every available furnace and mill was operating at a record breaking pace on war orders, the dawn of the new year finds the industry well equipped mechanically to meet world-wide competition. The progress now being made in the design and construction of blast furnace and steel works machinery, as indicated by installations completed and building during 1919, is rapid, and there can be no doubt but that the manufacturing facilities of the industry are in far better condition, at least in point of equipment, than ever before.

In spite of the stress placed upon speed in erecting new plants, much careful attention is being given to refinements calculated to insure smoother operation. Steelmakers have suffered considerably in the past through reduced production due to the temporary idleness of disabled machinery. With the improvements now being incorporated in new mills and accessories this loss will be curtailed, and



as these refinements are more generally adopted, the gain in production is sure to become noticeable. For the first time in the history of the industry in this country, plans now are under way for extensive laboratory investigations of the stresses on the roll necks and bearings of mills. Roller bearings are fast supplanting metal bearings on many types of rolling mill equipment and it is said to be only a matter of a short time until they will be available for rolls of the largest diameters. Electricity, with its easy adaptability to automatic control, is now gaining entry to plants where heretofore it was unwelcome. Manufacturers of gas and steam engines are constantly adding improved valves and other refinements which increase the efficiency of their products. Cranes, ingot strippers and charging machines also are undergoing development which make them better suited to uninterrupted service.

Machines Do Work of Man

Outstanding among the many innovations introduced in new equipment are devices designed to eliminate manual labor. The recent steel strike badly disarranged the mill and furnace organizations in many plants and it now is necessary in many instances to train new crews of inexperienced men. This task is being lightened by the use of special machinery. Many of the newest blast furnaces are equipped with mechanical aids which do away with 15 per cent of the working force, while some of the older stacks are being remodeled to effect similar savings. The campaign of conservation of man power is spreading to the steel mills where the increased use of electric controlling apparatus, continuous mills and improved manipulators is reducing the number of workers required. At the present rate of progress, it will be only a comparatively short time until the working force for many steelmaking operations will be appreciably reduced.

Nor are the efforts of engineers being confined to developing means of insuring uninterrupted operation and conserving man power. During the year an unusual amount of attention was given to many obstacles which stood in the way of progress in the efficient use of raw materials and by-products. Many of the difficulties encountered in the early days of powered coal utilization are being overcome by the introduction of improved pulverizing machinery, driers and burners. Much progress is being made in the cleaning of blast furnace gas. Although great strides are apparent in the development of washing and scrubbing devices, the most notable step forward is the attempt to employ electrical precipitation for this purpose. With the improvements promised by the present work in purifying blast furnace gases, the United States soon will surpass Europe in the perfection of this type of apparatus. The cooling of furnace linings, which has been the source of considerable trouble in the past, is gradually yielding to solution. Open hearths are greatly improved in this respect and similar progress is reported in blast furnace plants.

A noteworthy tendency toward accident prevention is apparent in new machinery. The safety movement has passed the stage wherein protective appliances were added as an afterthought and in the future these devices will be built into the equipment. New mill tables are better guarded than heretofore; cooling plates designed to improve working conditions near furnaces and hot beds are more widely used; working places around blast furnaces are adequately lighted; and wet and greasy floors, once considered a necessary evil around furnaces and mills, are being gradually eliminated by the improved design and construction of modern machinery.

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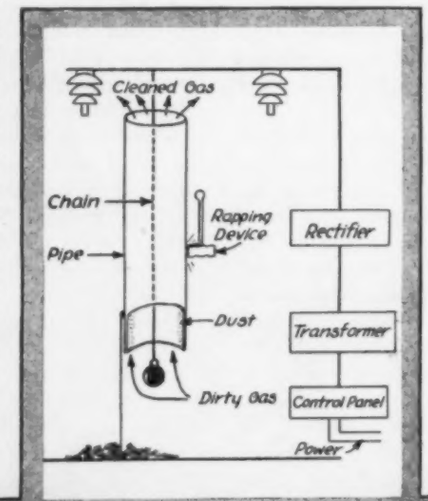
TENDENCIES in the design of blast furnace plants are best judged on the basis of the latest installations. Of the 14 new stacks under construction at the end of 1919, 13 have a nominal rating of more than 500 tons. Since the one exception, a 350-ton furnace, will be operated on a merchant iron, it can be safely stated that the standard steel works furnace of today is represented by the 550 and 600-ton types. Whether or not these sizes soon will be exceeded is problematic. J. G. West, blast furnace superintendent of the Jones & Laughlin Steel Co., Pittsburgh, in commenting on this question at a meeting of the American



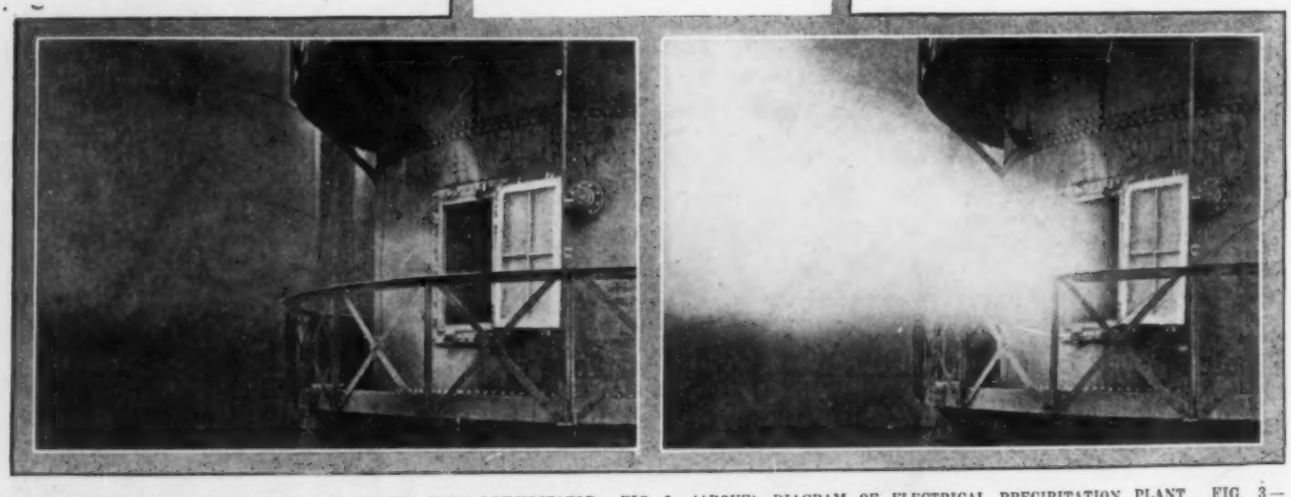
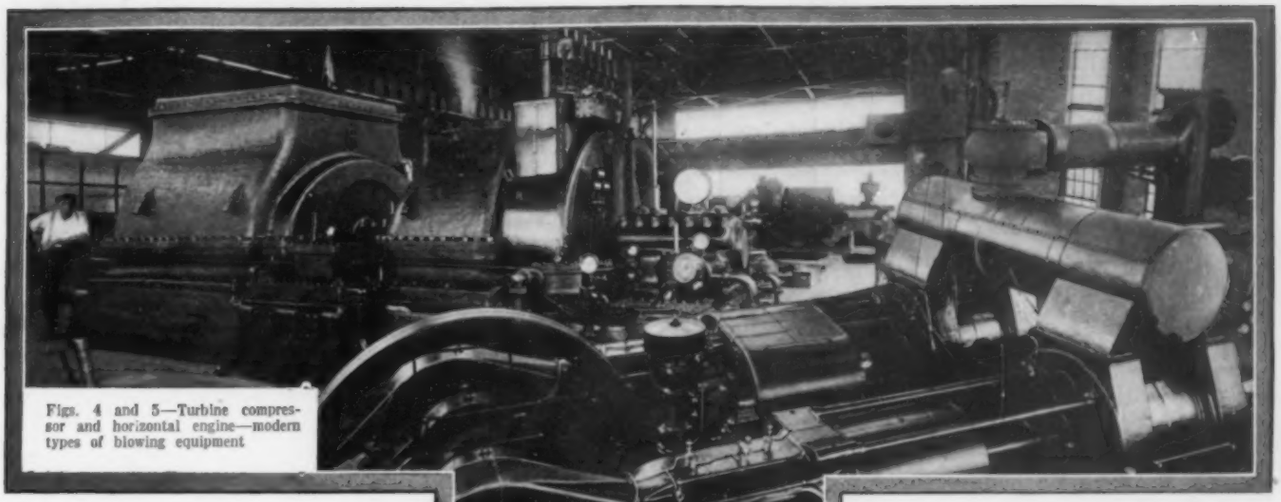


FIG. 1—APPEARANCE OF CLEANED GAS COMING FROM PRECIPITATOR. FIG. 2—(ABOVE) DIAGRAM OF ELECTRICAL PRECIPITATION PLANT. FIG. 3—UNCLEANED GAS FROM PRECIPITATOR WHEN CURRENT IS OFF



Figs. 4 and 5—Turbine compressor and horizontal engine—modern types of blowing equipment

Iron and Steel institute, said that "the 1000-ton furnace is not an idea that will be abandoned, but will be attained; whether along the present lines or a complete revolution of design, no one knows. Science has not been able to go faster than practice has allowed."

A composite idea of the details of the modern type of furnace may be gained from a careful comparison of the principal dimensions and equipment of several of the latest installations. It is apparent that the heights vary from 90 to 100 feet, the bosh diameters are about 22½ feet, and the capacity from tap hole to bottom of the bell averages approximately 25,500 cubic feet. There seems to be a tendency toward larger hearths, the diameters approaching 20 feet in a few instances.

Following an extensive trial of thin linings, which covered several years, designers seem to have reached the conclusion that the brick above the mantle should be just thick enough to preclude the necessity of using cooling devices. That there is considerable difference of opinion as to what thickness fulfills this condition is indicated by the fact that linings varying from 31½ to 45 inches in thickness are being used without cooling apparatus.

Put End to Wet Furnace Floors

Numerous refinements in the handling of discharged cooling water are noticeable on modern furnaces. The valves on discharge pipes bear tags indicating the number of the tuyeres, coolers and bosh plates to prevent the water tender from turning the wrong valve. In addition to this innovation, the new furnace of the Weirton Steel Co. is equipped with a trough around the shell at the extreme top of the bosh to prevent water from dripping on the furnace floor in case it becomes necessary to install sprays when a hot spot develops. Improvements of this kind have been largely responsible for the absence of water around the bases of new furnaces.

One of the most troublesome problems of blast furnace operation is the removal of fine dust and fumes from blast furnace gas. Clean gas yields better results from combustion, enables the operator to increase production by blowing more air per minute than is possible with dirty gas, and promotes economy through its less destructive action on stove brick and savings in the expense of cleaning the stoves and boilers. Most of the furnaces in the United States are provided with one or more dust catchers and wet cleaning apparatus, the latter equipment having become extremely popular within the past few years. Notwithstanding the fact that the washers are the most efficient gas cleaners in general use today, they have several disadvantages, chief of which is the loss of sensible heat suffered by the gas in the washing process. For this and other reasons, blast furnace men are evincing more than casual interest in the development of another method of gas cleaning which has been applied to a Pennsylvania furnace during the year.

This installation, which is the first of its kind in the country, is at the furnace of the American Manganese Mfg. Co., Dunbar, Pa. It is an adaptation of the Cottrell process of electrical precipitation which heretofore was employed exclusively in the cement industry and in a number of metallurgical processes. Fig. 2 illustrates the principle of this apparatus, which consists chiefly of a control panel, rectifier, a chain or wire electrode, a vertical pipe, and the necessary valves and accessories. As indicated in the drawing, the chain which serves as the electrode is suspended in the center of the pipe and is held taut by a weight at the lower end. The electrode is amply insulated from the pipe, which is grounded. The dirty gas enters the pipe at bottom and is carried upward by the pressure behind it. The high tension unidirectional current of the electrode rapidly and thoroughly ionizes the dirty gas, and immediately upon becoming charged, the dust and fume particles are repelled by the electrode and deposited on the wall of the pipe, which interrupts their flight from the chain. The repelling force of the electrode, which is horizontal, in conjunction with the upward pressure of the gas, produces a resultant force directed diagonally upward and outward to the wall of the pipe. The problem of electrical precipitation is to regulate these vertical and horizontal forces so that the dust is properly deposited upon the pipe. The accumulated dust and fume is removed by shutting off the current and rapping the side of the pipe.

Description of Dunbar Plant

The plant at Dunbar consists of an electric house, containing two sets of the necessary electrical equipment, and two precipitators. Power is generated by a steam-driven, 3-phase, 450 kilovolt-ampere, 2300-volt unit operating at 150 revolutions per minute. The line voltage is stepped down to

230 volts, which is handled by a 4-shoe rectifier driven by a 4-pole synchronous induction motor. Each of the precipitators is 36 feet high and has an internal diameter of 12 feet. The shells are of ¼-inch steel plate having gas-tight riveted seams, and contain numerous vertical pipes, each 6 inches in diameter and 10 feet long. The electrode chains hang from a single framework suspended above the pipes. After entering the precipitators, the gas passes through a header and up into the pipes, emerging above the electrode hangers into clean gas mains. The rapping hammers, which act upon reinforcing collars on the pipes, are connected to levers so that an operator can rap as many as 20 or 30 pipes by moving a single lever.

Cleaning of Stoves Unnecessary

Dustographs obtained at the Dunbar plant show that the precipitators clean the gas with surprising efficiency. Figs. 1 and 3 show the appearance of the gas as it emerges in the cleaned and uncleaned state. The most tangible results are noted by N. H. Gellert and K. V. Laird in a paper describing the installation recently delivered before the Philadelphia section of the American Iron and Steel Electrical Engineers. The authors state:

"Previously, from four to six men were constantly used at Dunbar in cleaning the stove wells and combustion chambers and boilers of their dust burden. * * * After the precipitators were started in operation, the men were taken off the job and for weeks at a time not a single man was used to clean any of the material from the stoves and boilers because of the entire absence of any dust deposits. It was only after difficulties were encountered with the insulators and the plant was shut down for insulator repairs that dust began to accumulate in the stoves and boilers again, and men had to be used for cleaning. * * *"

"Actual measurements show that the gas at Dunbar was cleaned to 0.06 grain of dust per cubic foot of gas. While it is not expected that this will be the average condition, still it is expected that at no time will the dust content be over one-tenth of a grain of dust per cubic foot of gas."

A second electrical precipitation plant has been installed at Sheridan, Pa., and with two stacks available for experimental work, it soon should be possible for blast furnace operators to satisfy themselves as to the relative advantages and disadvantages of the new process.

Except where unusual conditions prevail, modern blast furnaces are being equipped with only three stoves. The reduction from four and five stoves has been made possible by the use of smaller checker openings. The dimensions of the stoves of three late furnaces are respectively 23 x 105, 24 x 100, and 22 x 100 feet. All of these stoves are of the 2-pass, side combustion type with checkers 3½ inches square. The heating surfaces average approximately 95,000 square feet per stove, indicating that designing engineers have reduced the number of stoves without materially affecting the available heating surface.

The choice of blowing apparatus for most of the furnaces recently constructed seems to lie between horizontal, cross-compound steam or gas engines and turbine blowers. The efficiency of these units has been increased in recent years by the introduction of improved valves and other fittings. Great improvement in power house equipment is being made and today the average new blast furnace power plant compares favorably in appearance and efficiency with the generating stations of other branches of industry. Much of the equipment is installed in duplicate to insure uninterrupted operation in case of breakdown and in many instances the boilers are arranged for two kinds of fuel. Practically all of the accessories known in power plant engineering, many of which heretofore were confined to only the largest generating stations, now are found in every modern blast furnace plant. Among the auxiliaries recently added are mechanical stokers, superheaters, soot blowers, water softening apparatus and condensers.

A distinct advance is being made in the application of automatic control to various parts of blast furnace apparatus. Cold blast mains frequently are equipped with automatic relief valves which open at a predetermined pressure, usually about 25 pounds per square inch. Another example of the progress being made in this direction is the tendency toward the use of electrically controlled gate valves. The new stack of the Sheet & Tube Co. of America, South Chicago, is equipped with two power operated 36-inch gate valves on the cold blast mains. The control station is near the turbine throttles.

Automatic Control Aids Operation

Clay guns are being specified for many of the latest furnaces, not only on account of the protection they offer against accident, but also because they permit keeping the blast on the furnace and gas at the boilers nearer to the maximum. Another aid which tends to reduce manual labor around the furnace is a monorail for carrying coke dust, sand, loam and clay to the cast house; removing scrap and rubbish; and handling tuyeres and furnace tools. Electric signalling apparatus connecting the engine room with the furnace floor, with supplementary telephone service for emergencies, serves to save steps and time in a number of new furnaces. A further refinement of this nature is found in the No. 8 furnace of the Lackawanna Steel Co., Buffalo, where a passenger and freight elevator of 1500 pounds capacity plies between the ground level and the top of the stoves and furnace.

Sintering, a process which is closely associated with blast furnace operation, is receiving increased attention at the present time. Within the past year a sintering machine with a grate area of 450 square feet, practically two and one-half times as large as any existing apparatus, was placed in operation at the plant of the Carnegie Steel Co., New Castle, Pa. In this machine, two strands of pallets are employed instead of one, as in the smaller types. Its daily capacity of from 550 to 650 tons of flue dust sinter or from 650 to 750 tons of pyrites cinder sinter makes it desirable for companies operating a group of furnaces.

* * * * * *

THOSE who are familiar with the series of papers on blast furnace construction and operation presented at meetings of the American Iron and Steel institute during the past few years realize that the proposed study of the problems of open hearths undoubtedly will have a beneficial influence upon their future development. In the introductory paper of the new series, Dr. Henry Marion Howe forecasts the probable trend in the design of these units. He recognizes the need of designing tilting furnaces so as to reduce the cost of their upkeep until it no longer is a serious consideration in deciding between the tilting and stationary types; suggests changes in the size of openings in regenerators; recommends a careful investigation to determine in what parts of the furnaces the advantage of accurate retention of shape by means of water cooling outweighs the loss of heat involved; and asks for data on the useful limit of the size of open hearths.

In the light of prevailing practice, the tendency is to specify large tilting furnaces and small stationary units. Of the 48 open hearths completed or under construction in 1919, seven are of the 200-ton tilting type, while the

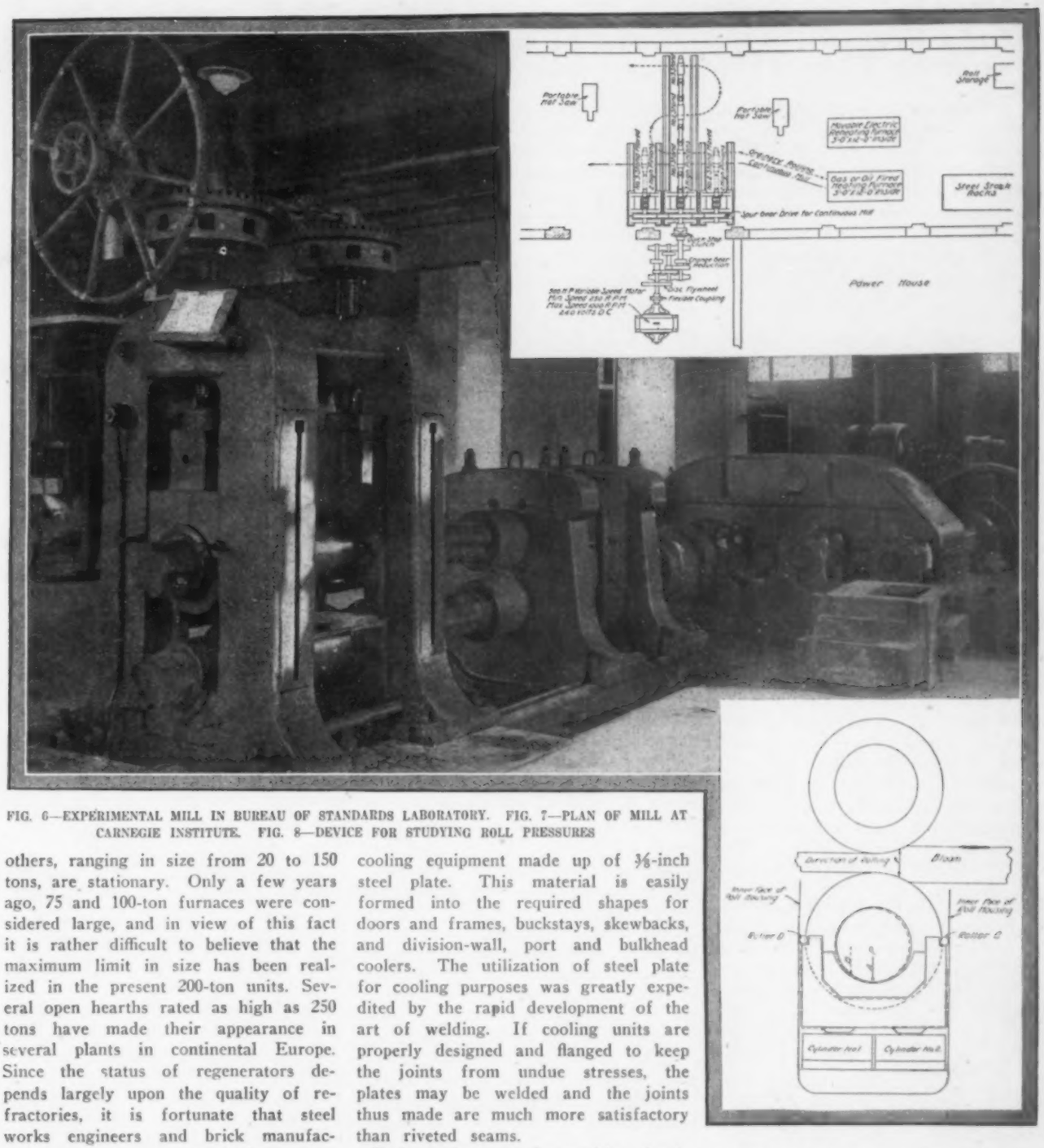


FIG. 6—EXPERIMENTAL MILL IN BUREAU OF STANDARDS LABORATORY. FIG. 7—PLAN OF MILL AT CARNEGIE INSTITUTE. FIG. 8—DEVICE FOR STUDYING ROLL PRESSURES

others, ranging in size from 20 to 150 tons, are stationary. Only a few years ago, 75 and 100-ton furnaces were considered large, and in view of this fact it is rather difficult to believe that the maximum limit in size has been realized in the present 200-ton units. Several open hearths rated as high as 250 tons have made their appearance in several plants in continental Europe. Since the status of regenerators depends largely upon the quality of refractories, it is fortunate that steel works engineers and brick manufacturers now are co-operating more smoothly than heretofore in the development of better refractories. Reversing valves are constantly undergoing improvements, several new features having been introduced within the past year.

Welding Helps Design of Cooling Units

Cooling of ports, valves and other parts of furnaces is receiving intelligent consideration. Up to within a short time ago castings with cast-in pipe coils were used extensively to protect furnace doors and frames, whereas now the tendency is to use cooling equipment made up of ⅜-inch steel plate. This material is easily formed into the required shapes for doors and frames, buckstays, skewbacks, and division-wall, port and bulkhead coolers. The utilization of steel plate for cooling purposes was greatly expedited by the rapid development of the art of welding. If cooling units are properly designed and flanged to keep the joints from undue stresses, the plates may be welded and the joints thus made are much more satisfactory than riveted seams.

Perhaps the most far-reaching development in open hearth and other types of steel works furnaces is embodied in the introduction of equipment which permits the utilization of light and heavy oils and powdered coal. Oil-burning furnaces are in operation in many plants, especially in the Mississippi valley and at tidewater on the Atlantic seaboard. Powdered coal, while slowly gaining in favor for open-hearth application, is proving so successful in other types of furnaces that its use is being specified by a number of large steel companies for certain units of new plants. Conservative estimates place the present annual consumption of powdered coal at from 12,000,000 to 15,000,000 tons and the number of plants using this fuel at 250.

Improve Powdered Coal Apparatus

Powdered coal is especially adapted to furnaces in sheet mills. Many sheet manufacturers are turning to pulverized fuel to supplant the fast failing gas supplies. One of the latest decisions to adopt the fuel was made by the Inland Steel Co., South Chicago. The growing popularity of powdered coal undoubtedly is due to the improvements which have made it possi-

ble to convey the particles of fuel long distances through ordinary pipes. At the sheet mill of the Newport Rolling Mill Co., Newport, Ky., powdered coal is carried in bulk through 4-inch standard wrought iron pipe for varying distances totaling more than 2500 feet. The coal first passes through a single roll crusher, then over a magnetic separator and into a storage bin. After going through a rotary drier the crushed coal enters pulverizing mills, after which the coal particles are separated from the air and discharged into another storage bin. As the fuel is admitted to blowing tanks from the bin, it is carefully weighed in order to give the operator a check on the amounts delivered to each furnace bin. After entering the distributing cycle, the coal is carried along by compressed air to the furnace bins, where it is diverted from the transport lines by hand operated switching valves. Gages on the fuel bins enable the furnace operators to check the amount of fuel delivered with the records kept by the milling plant operator. The delivery of fuel to the furnaces from the furnace bins is governed by sensitive control apparatus.

The maximum fuel consumption on slab furnaces at this plant has been 180 pounds per ton of product while on the sheet and pair furnaces the consumption covering long periods of time has not exceeded 275 pounds. The consumption of powdered coal on annealing furnaces and galvanizing pots has been well under 170 and 110 pounds per ton, respectively.

* * *

UP UNTIL the past year little if any research work on rolling mill problems was conducted in laboratories, most of the investigations along this line being made in the plant. Therefore the installation of experimental rolling mills in the laboratories of the United States bureau of standards at Washington and of the Carnegie Institute of Technology at Pittsburgh marks the beginning of a new era of research which should prove of far-reaching benefit to the iron and steel industry.

From the contemplated work already announced, the mill at Pittsburgh will yield valuable data within a comparatively short time. As shown in Fig. 7, which is a plan of the proposed mill, the equipment will consist of three stands of 3-high rolls driven by a 300-horsepower variable speed motor. The drive and change gears will be arranged so that any number of revolutions between 4 and 1000 per minute can be obtained. The mill and the drive will be equipped with complete automatic recording instruments and other devices calculating to assist in securing data of mill operation. W. E. Skinkle, director, bureau of rolling mill research, Carnegie Institute of Technology, is in charge of designing apparatus for making accurate determination of the friction losses on roll necks and the spreading forces on rolls and roll housings. The principal features of this equipment are illustrated in Fig. 8. Reduced to its simplest terms, the device consists of an ordinary rolling mill housing so designed that two hydraulic supporting cylinders may be placed under the carrier for the bottom roll. The carrier rests on the plungers of these cylinders in such a manner that the forces acting on the roll necks are recorded by the resulting hydrostatic pressure in the cylinders. In making determination with this apparatus the factor of friction, insofar as the movement of the plungers in the cylinders is concerned, it ignored, ball bearings at the top and bottom of the plungers having practically reduced the actual friction to a minimum.

The first cylinder of this type is now in the course of construction and will be carefully tested and calibrated under a 600,000-pound compression testing machine before the final design is produced for the experimental mill. More than half the funds necessary to add this experimental rolling mill have been definitely subscribed and the remainder is in sight. The work at Carnegie should be especially valuable in view of the fact that a number of steel companies and builders of rolling mill machinery are co-operating with the institute in inaugurating and maintaining the research.

The three outstanding features in the recent development of rolling mills and accessory machinery, as indicated by recent installations, are the increased use of electricity for many purposes, the substitution of ball and roller bearings for plain metal bearings in all types of machinery and improvement in the design and construction of manipulating devices. Of the steel mill motors sold but not yet erected by the Westhouse Electric & Mfg. Co., Pittsburgh,, the following are indicative of the trend in the use of electric drives: One 17,500-horsepower reversing motor equipment for 60-inch universal plate mill, Bethlehem Steel Co., Sparrows Point, Md.; two 4000-horsepower motors for 18-inch continuous bar mill, Weirton Steel Co., Weirton, W. Va.; one 17,600-horsepower motor equipment for 40-inch blooming mill, Bethlehem Steel Co., Steelton, Pa.; one 1800-horsepower motor for 22-inch billet and shape mill, one 800-horsepower and one 600-horsepower motor for bar mill, Scullin Steel Co., St. Louis; and one 200-horsepower motor for sheet mill, Newton Steel Co., Newton Falls, O.

Adopt Electricity in Many Plants

A study of a number of installations of typical rolling mill equipment made by the General Electric Co., Schenectady, N. Y., in 1919, further emphasizes the fact that electric drive is being used more widely than heretofore. Of the motors erected in the past year the following are typical: One 700-horsepower normal, 2450-horsepower maximum reversing motor for hydraulic electric shear, one 5600-horsepower reversing motor for 45-inch blooming mill, one 4000-horsepower motor for 110-inch plate mill, and one 3000-horsepower motor for finishing mill for Tennessee Coal, Iron & Railway Co., Fairfield, Ala.; one 5000-horsepower reversing motor for 40-inch blooming mill, Bethlehem Steel Co., Sparrow's Point, Md.; one 1200, two 700 and one 600-horsepower induction motors for merchant mill, Lackawanna Steel Co., Buffalo; and one 1800 and one 900-horsepower induction motors for Acme Steel Goods Co., Chicago.

An idea of the extent to which roller bearings have been introduced may be gained from reports of installations by the Hyatt Roller Bearing Co., New York. Bearings of this type are used in the mills of 48 companies, or, in other words, practically 90 per cent of the mills in the United States. At the present time roller bearings are being used in the construction of cranes; ingot, charging casting, ore, ladle, cinder, coke oven and skelp cars; buggies; hot and cold saws; soaking pit covers; tilting tables; plate castors and roll tables of all kinds.

The leading manufacturer of roller bearings for steel mills reports that hot and cold saws equipped with their product are in operation in the mills of 13 steel companies. One of these hot saws placed in operation in July, 1918, still is running on its original roller bearings. More than 2000 of the ingot and charging cars of the steel industry are now equipped with roller bearings. Cars equipped at the Ohio works of the Carnegie Steel Co. have been in operation for three years. They are lubricated once every six months and now are in good condition.

Roller bearings are used on the tilting tables of 12 plate mills and on the tables of two blooming mills, 10 hoop and bar mills, four strip mills and one billet mill. Plate castors equipped with roller bearings number

(*Concluded on Page* 42)

Many Plants Will Open in 1920

Although New Construction Completed in 1919 Lagged Behind Records of Previous Years, Number of Blast Furnaces, Open Hearths and Rolling Mills Now Building Forecasts Unusual Growth in 1920

BY JOHN D. KNOX

PROSPECTS for additions to steel-producing capacity in 1920 are less favorable than they were a year ago. While 25 open-hearth units, or two more than in 1919, are under construction at present, still their rated annual capacities are 479,000 tons less than the output of the furnaces completed in 1919. However, if the 200-ton furnaces, which are employed in duplexing operations, are disregarded in both lists, the units scheduled for completion in 1920 show a greater aggregate capacity than those built in 1919.

A year ago open-hearth furnaces under way promised 1,005,000 additional tons to the country's steel-making capacity, 12 furnaces being involved in the building program. At the beginning of 1917, 95 open-hearth units, having a rated capacity of 4,795,500 tons, were under construction, while early in 1916, the furnaces in the course of erection numbered 74 with an estimated capacity of 3,755,000 gross tons. The number of open-hearth furnaces completed since 1913 together with their annual rated capacity and the national ingot capacity, follows:

Year	Number of Furnaces	Gross Tons	National Ingot Cap.
1919	23	1,871,000	52,200,000
1918	39	2,192,500	50,500,000
1917	101	5,413,000	48,500,000
1916	105	4,300 000	43,000,000
1915	43	1,759,000	39,000,000
1914	9	507,000	37,500,000
1913	62	3,120,000	37,000,000

Table II shows the details by companies, the number of furnaces built and the increased steel-ingot capacity for 1919. The number of open-hearth furnaces completed last year was 23 with an estimated annual capacity of 1,871,000 tons. This compares with a record of 39 furnaces with an estimated capacity of 2,192,500 tons completed in 1918. Therefore, the decrease in capacity for 1919 as against 1918 is 321,500 tons, with a reduction in the number of furnaces of 17.

Since 1914 steelmakers have leaned toward larger stationary open-hearth furnaces. The new units charged in 1914 had an average yearly rating of 38,000 tons each. On Jan. 1, 1915, the rating averaged 40,907 tons each. In 1916 individual ratings increased to 42,574 tons. The succeeding year showed a further jump to 47,097 tons while 1918 recorded an average output of 51,381 tons. The new open-hearths built last year averaged 64,437 tons each. These figures, however, do not include the 200-ton units adapted to the duplexing process, the comparison having been confined to those furnaces which work their heat direct from the cold charge.

On Jan. 1, 1915, the annual steel-ingot output of the United States was estimated to be 37,500,000 tons. With the new furnaces built during that year, the capacity was brought up to 39,000,000. The new furnaces placed in action during 1916 swelled the figures to 43,000,000 tons. During 1917, the addition of more than 5,000,000 tons led to an estimate of 48,500,000 tons. Additions during 1918 averaged over 2,000,000 tons and brought the estimate of the country's ingot-producing capacity up to 50,500,000 tons. With the increased open-hearth capacity built during the past 12 months the estimated ingot producing capacity of the country on Dec. 31, 1919, was 52,200,000 tons. On Jan. 1, 1914, the ingot-producing capacity of the United States was estimated by THE IRON TRADE REVIEW as 37,000,000 tons. The increase in ingot production during the six-year period, therefore, is 15,200,000 tons or 41 per cent. This increase was due largely to the tremendous demand brought about by war conditions.

Only two blast furnaces were completed in 1919, as shown in Table IV, thus giving 396,750 tons additional to America's estimated iron-smelting capacity. This tonnage compared with reports covering the last 15 years of new blast-furnace production, places 1919 as the second lowest year on the list, 1914 marking a pause when no new stacks were lighted. In 1918 nine stacks were placed in action, these having an annual capacity of 1,425,000 tons or 3.5 per cent greater output than last year. The record made in 1917 when the blast was turned on 14 new stacks, continues to stand out prominently. The new stacks had a rated capacity of 2,182,500 tons annually or 5.5 per cent more than last years additional units. At the opening of 1920 construction had been started on 12 blast furnaces having a total estimated capacity of 2,190,750 tons. The names of the companies having stacks

Table I
New Electric Furnaces Operated in 1919

	No. of furnaces	Size tons
HEROULT		
Best Steel Casting Co., Oakland, Cal.	1	6
Braeburn Steel Co., Braeburn, Pa.	2	24
Crucible Steel Casting Co., Lansdowne, Pa.	1	2
Henry Disston & Sons, Inc., Philadelphia	1	18
Driver-Harris Co., Harrison, N. J.	1	3
Electric Steel & Forge Co., Cleveland	1	6
Fort Pitt Steel Casting Co., McKeesport, Pa.	1	3
Hub Electric Steel Casting Co., Boston	1	2
Midvale Steel & Ordnance Co., Nicetown, Philadelphia	1	6
Southern California Iron & Steel Co., Los Angeles	1	6
Southern Pacific Co., Sacramento, Cal.	1	6
U. S. Government, Naval Ordnance Factory, Charleston, W. Va.	2	40
GREAVES-ETCHELLS		
American Radiator Co., Buffalo	1	½
Bird-Archer Co., Cohoes, N. Y.	1	½
Dodge Steel Castings Co., Philadelphia	1	3
Ford Motor Co., Detroit	1	3
Hammond Steel Co., Inc., Syracuse, N. Y.	1	3
Hoskins Mfg. Co., Detroit	1	½
Sullivan Machinery Co., Claremont, N. H.	1	1
GREENE		
Lamb Machine Co., Hoquiam, Wash.	1	2
Malleable Steel & Iron Co., Tacoma, Wash.	1	½
Vulcan Mfg. Co., Seattle	1	1½
LUDLUM		
American Cast Iron Pipe Co., Birmingham, Ala.	1	6
Andes Electin Corp., Coney Island, N. Y.	1	special
Metal Alloys, Inc., Watervliet, N. Y.	3	5
Metals Alloys, Inc., Watervliet, N. Y.	9	single
Omaha Structural Steel Works, Omaha, Neb.	1	½
Westinghouse Electric & Mfg. Co., Trafford, Pa.	1	6
MOORE		
American Radiator Co., Buffalo	1	3
Farrell-Cheek Steel Foundry Co., Sandusky, O.	1	3
McQuay-Norris Mfg. Co., St. Louis	1	3
Gerlinger Steel Casting Co., Milwaukee	1	3
RENNERFELT		
A. M. Byers Co., Pittsburgh	1	½
Driver-Harris Co., Harrison, N. J.	1	300 lbs.
Liberty Steel Co., Morristown, N. J.	1	½
Philadelphia Electric Steel, Conshohocken, Pa.	1	1
U. S. High Speed Steel & Tool Corp., Albany, N. Y.	2	½
SPECIAL		
Crucible Steel Forge Co., Cleveland	1	25
Rothert Process Steel Co., Seattle	1	
BOOTH		
Union Motor Truck Co., Bay City, Mich.	1	1½
	53	

under construction together with the number and capacities are shown in Table V.

America's pig iron capacities in gross tons of all new furnaces placed in blast each year from 1905 to 1919 inclusive, is as follows:

Year	Gross Tons
1919	396,750
1918	1,425,000
1917	2,182,500
1916	530,000
1915	530,000
1914	None
1913	550,000
1912	1,000,000
1911	565,000
1910	1,794,000
1909	1,930,000
1908	1,188,000
1907	2,065,000
1906	1,135,000
1905	1,292,000

On Jan. 1, 1920 America's blast-furnace capacity was estimated to be 44,400,000 tons or a growth of 11.1 per cent in three years. Actual pig-iron production in 1919 was about 30,000,000 tons as against 38,437,488 tons in 1918.

In 1918 the production of by-product coke was 25,997,580 tons or 46 per cent of the coke produced in the United States. In 1917 the production of this grade of fuel was 22,439,280 tons or 13.6 per cent less than the succeeding year. In 1918 there were produced 30,480,605 tons of beehive coke or 54 per cent of the country's output. In the previous year beehive production amounted to 33,167,548 tons or about 60 per cent of all coke made in the country. In 1913 beehive output showed 33,584,830 tons or about 72.5 per cent of the national coke yield. Comparing the output of this grade for 1918 with the corresponding output for 1910, it will be noticed that the production has dropped off about 18.5 per cent.

About the beginning of the third quarter of 1918 by-product output was trailing beehive production closely. Finally in November of that year, word was announced from Washington that by-product had passed beehive output. Thus the hopes of many coke operators were achieved after about 10 years of steady progress. While 1918 closed with over 50 per cent of the coke production of America on the side of by-product ovens, still the national annual report of the two grades showed beehive to be on top by 4,483,025 tons. During 1919 approximately 1000 beehive ovens were abandoned in the Connellsville region. On the other hand 783 by-product ovens, as shown in Table VI, were placed in action. While production figures of by-product coke for 1919 are unavailable at present, still it seems plausible to predict that last year's production of this grade will exceed the output of beehive coke. If this prediction is correct, 1919 will mark the turning point in the rivalry for supremacy that has existed for over 10 years.

Of the number of new rolling mills building or completed, as shown in Tables VIII and IX, sheet mills lead with the unprecedented total of 105 units. This construction reflects the tremendous expansion of the automotive industries and while not directly traceable to this demand, no doubt exists that sheet mill construction is pyramided on automobile sales.

Table II

Open Hearths Completed During 1919

Company	Number	Daily Cap.	Annual Cap.
Andrews Steel Co., Newport, Ky.	2	105	145,000
Atlantic Steel Co., Atlanta, Ga.	1	50	35,000
Bethlehem Steel Co., Sparrows Point, Md.	3	200	360,000
Central Iron & Steel Co., Harrisburg, Pa.	1	100	70,000
Illinois Steel Co., Gary, Ind.	1	200	120,000
John A. Roebling's Sons Co., Trenton, N. J.	2	200	240,000
McKinney Steel Co., Cleveland	2	100	140,000
National Enameling & Stamping Co., Granite City, Ill.	3	150	285,000
Sharon Steel Hoop Co., Lowellville, O.	2	150	190,000
Tennessee Coal, Iron & Railroad Co., Birmingham, Ala.	1	200	120,000
United Steel Co., Everett, Wash.	1	25	22,000
Vulcan Iron Works, Wilkesbarre, Pa.	1	40	30,000
Wayne Steel Co., Erie, Pa.	2	25	44,000
Worth Steel Co., Claymont, Del.	1	100	70,000
	23		1,871,000

Table III

Open Hearths Building Dec. 31, 1919

Company	Number	Daily Cap.	Annual Cap.
Bethlehem Steel Co., Sparrows Point, Md.	1	200	120,000
Black Steel & Wire Co., Kansas City, Mo.	2	75	100,000
Follansbee Bros. Co., Follansbee, W. Va.	4	40	120,000
Interstate Iron & Steel Co., South Chicago, Ill.	1	75	50,000
Judson Mfg. Co., Emery, Cal.	1	50	35,000
Kansas City Bolt & Nut Co., Kansas City, Mo.	2	100	140,000
Lukens Steel Co., Coatesville, Pa.	2	100	140,000
Stanley Works, New Britain, Conn.	1	25	22,000
Weirton Steel Co., Weirton, W. Va.	7	100	490,000
Western Rolling Mill Corp., Seattle, Wash.	3	50	105,000
Worth Steel Co., Claymont, Del.	1	100	70,000
	25		1,392,000

Table IV

Blast Furnaces Completed During 1919

Company	Number	Daily Cap.	Annual Cap.
Jones & Laughlin Steel Co., Aliquippa, Pa.	1	550	189,750
Weirton Steel Co., Weirton, W. Va.	1	600	207,000
			396,750

Table V

Blast Furnaces Building Dec. 31, 1919

Company	Number	Daily Cap.	Annual Cap.
Alan Wood Iron & Steel Co., Swedeland, Pa.	1	500	172,500
Ford Motor Co., Detroit	2	600	414,000
Hamilton Furnace Co., Hamilton, O.	1	550	189,750
National Tube Co., Gary, Ind.	4	500	690,000
Pittsburgh Crucible Steel Co., Midland, Pa.	1	600	207,000
St. Louis Coke & Chemical Co., St. Louis	1	550	189,750
Steel & Tube Co. of America, Chicago	1	600	207,000
Utah Iron & Steel Co., Midvale, Utah	1	350	120,750
	12		2,190,750

Table VI

By-Product Ovens Completed in 1919

Company	No. Ovens	Type Ovens	Est. Annual Coking Cap
American Steel & Wire Co., Newburgh, O.	60	Semet-Solvay	310,980
Carnegie Steel Co., Clairton, Pa.	128	Koppers	570,125
Citizens Gas Co., Indianapolis, Ind.	40	Wilputte	176,400
Jones & Laughlin Steel Co., Hazelwood, Pa.	240	Koppers	1,040,000
Providence Gas Co., Providence, R. I.	40	Koppers	165,000
Rainey-Wood Coke Co., Swedeland, Pa.	110	Koppers	500,000
Tenn. Coal, Iron & R. R. Co., Birmingham, Ala.	77	Koppers	345,000
Wisconsin Steel Co., South Chicago, Ill.	88	Wilputte	376,000
	783		3,483,505

Table VII

Ovens Building Dec. 31, 1919

Company	No. Ovens	Type Ovens	Est. Annual Coking Cap
Bethlehem Steel Co., Sparrows Point, Md.	180	Koppers	788,400
Birmingham Coke & By-Product Co., Birmingham, Ala.	50	Koppers	235,000
Domestic Coke Corp., Fairmont, W. Va.	60	Koppers	260,000
Donner Union Coke Corp., Buffalo	150	Koppers	650,000
Ford Motor Co., Detroit	120	Semet-Solvay	621,960
Jones & Laughlin Steel Co., Hazelwood, Pa.	60	Koppers	260,000
Lackawanna Steel Co., Buffalo	60	Semet-Solvay	310,980
Pittsburgh Crucible Steel Co., Midland, Pa.	100	Koppers	435,000
Sloss-Sheffield Steel & Iron Co., Birmingham, Ala.	120	Semet-Solvay	621,960
Steel & Tube Co. of America, Indiana Harbor, Ind.	120	Semet-Solvay	621,960
Tennessee Coal, Iron & R. Co., Birmingham, Ala.	77	Koppers	345,000
	1097		5,150,260

Table VIII

Rolling Mills Completed During 1919

Company	Number	Product
Acme Steel Goods Co., Chicago	1	Strips
Allegheny Steel Co., Pittsburgh	2	Sheets
American Sheet & Tin Plate Co., Cambridge, O.	1	Black plate
American Sheet & Tin Plate Co., Chester, W. Va.	1	Black plate
Apollo Steel Co., Apollo, Pa.	2	Sheets
Canton Sheet Steel Co., Canton, O.	1	Bars
Carnahan Tin Plate & Sheet Co., Canton, O.	1	Black plate
Chicago Electric Steel Co., Chicago	1	Bars
Donner Steel Co., Buffalo	2	Bars
Ft. Dodge Culvert & Iron Mill Co., Ft. Dodge, Iowa	1	Bars
Hudson Sheet & Tin Plate Co., Marietta, O.	6	Black plate
Hammond Steel Co., Syracuse, N. Y.	2	Bars
John A. Roebling's Sons Co., Trenton, N. J.	1	Billets, slabs, blooms
Massillon Rolling Mill Co., Massillon, O.	10	Sheets
Sharon Steel Hoop Co., Lowellville, O.	1	Billets, slabs, blooms
Sharon Steel Hoop Co., Lowellville, O.	1	Sheet bars
Steel & Tube Co. of America, Indiana Harbor, Ind.	3	Tubes
Ulster Iron Works, Dover, N. J.	1	Muck bars
United Steel Co., Lowell, Wash.	1	Bars, channels
Universal Steel Co., Charleroi, Pa.	2	Bars
Whitaker-Glessner Co., Beach Bottom, W. Va.	8	Sheets
Wycoff Drawn Steel Co., Ambridge, Pa.	1	Cold rolling
	50	

Table IX

Rolling Mills Building at End of 1919

Company	Number	Product
Aetna Iron & Steel Co., Gary, Ind.	6	Sheets
American Sheet & Tin Plate Co., Gary, Ind.	24	Black plate
American Rolling Mill Co., Middletown, O.	12	Sheets
Bethlehem Steel Co., South Bethlehem, Pa.	1	Billets
Bethlehem Steel Co., Sparrows Point, Md.	12	Black plate
Bethlehem Steel Co., Sparrows Point, Md.	10	Sheets
Cannonsburg Steel & Iron Works, Cannonsburg, Pa.	2	Sheets
Capital City Iron & Steel Co., Harrisburg, Pa.	1	Bars
Carnegie Steel Co., McDonald, O.	1	Bands
Detroit Seamless Steel Tubes Co., Detroit	1	Tubes
Eastern Rolling Mill Co., Baltimore, Md.	12	Sheets
Eastern Steel & Wire Co., Newark, N. J.	1	Wire
Falcon Steel Co., Niles, O.	8	Sheets
Follansbee Bros. Co., Toronto, O.	1	Sheet and tin bars
Follansbee Bros. Co., Toronto, O.	10	Sheets
Follansbee Bros. Co., Toronto, O.	10	Cold rolling
Hoosier Rolling Mill Co., Terre Haute, Ind.	1	Bars and rails
Interstate Iron & Steel Co., Chicago	1	Bars
Judson Mfg. Co., Emery, Cal.	2	Bars
Kansas City Bolt & Nut Co., Kansas City, Mo.	3	Bars and shapes
Mansfield Sheet & Tin Plate Co., Mansfield, O.	6	Sheets
Laclede Steel Co., Alton, Ill.	1	Strips
Minnesota Steel Co., Duluth, Minn.	1	Wire
National Tube Co., Gary, Ind.	1	Tubes
Newton Steel Co., Newton Falls, O.	8	Sheets
Newton Steel Co., Newton Falls, O.	4	Cold rolling
Otis Steel Co., Cleveland	1	Sheets
Pittsburgh Open Hearth Steel Co., Bridgeville, Pa.	1	Strips
Scullin Steel Co., St. Louis	2	Shapes and bars
Stanley Works, New Britain, Conn.	1	Billets
Stanley Works, New Britain, Conn.	1	Hoops
Superior Steel Co., Canton, O.	8	Sheets
Superior Steel Co., Canton, O.	4	Cold rolling
Tennessee Coal, Iron & Railroad Co., Fairfield, Ala.	1	Plates
Tennessee Coal, Iron & Railroad Co., Fairfield, Ala.	1	Billets, slabs, blooms
Tennessee Coal, Iron & Railroad Co., Fairfield, Ala.	1	Bars and shapes
Weirton Steel Co., Weirton, W. Va.	1	Billets, slabs, blooms
Weirton Steel Co., Weirton, W. Va.	1	Billets
Weirton Steel Co., Weirton, W. Va.	1	Sheet and tin bars
Western Rolling Mill Co., Seattle, Wash.	2	Bars
Worth Steel Co., Claymont, Del.	1	Plates
Youngstown Sheet & Tube Co., Youngstown, O.	1	Tubes
	168	

Large tonnages of sheets also are being absorbed by makers of office furniture, metal laths and roofing and enameling products. Stove and agricultural implement makers also are heavy buyers of this product. The demand for all grade of sheets but more especially for black and galvanized in light gages, was the heaviest during the last quarter of 1919 than at any similar period in the history of the country.

Sheet mill rolling schedules for the first three months of this year will be made up largely of last quarter's business. So that the incentive that led sheetmakers early in 1919 to lay down new mills, confident of the trade's ability to absorb the increased tonnage, certainly has not been in vain. The 22 stands of rolls, which were completed last year, no doubt will show a good return especially as the market price of sheets now is nominal under the existing top-notch demand.

The two largest developments in sheet mill construction for 1920 are in the East. Construction of sheet mills prior to this year has been confined largely to districts near Pittsburgh. The Bethlehem Steel Co. is building 10 sheet mills at its Sparrows Point plant while the Eastern Rolling Mill Co., Baltimore, also is building 12 units. At present there are no sheet mills east of the Pittsburgh district, it is stated, which are adapted to roll highly-finished product for use in fabricating automobiles, stoves, enamelware and metallic furniture.

This year 16 sheet mills are under construction in the Mahoning valley which, with the 82 units already built, will give a total of 98 stands of sheet mill rolls for the district. The Mahoning valley thus retains its distinction as the largest sheetmaking district in the country. In addition to the 28 sheet mills at the three plants of the Brier Hill Steel Co., the Youngstown Sheet & Tube Co. operates 15; the Sharon Steel Hoop Co., nine; the Mahoning Valley Steel Co., eight; the Republic Iron & Steel Co., 10; and the Trumbull Steel Co., 13. The Newton Steel Co., Newton Falls, O., expects to place its eight new units in operation in the spring while the Falcon Steel Co., Niles, O., expects to place its eight new units under power about June. The latter two plants when completed will produce about 110,000 tons of sheets per year thus increasing the sheet capacity of the Mahoning valley from 400,000 to 510,000 tons annually. In addition the Republic Iron & Steel Co. plans to build eight stands of rolls at its DeForest plant at Niles, O., this year. These mills when completed will add 50,000 tons to the sheet mill capacity of the Mahoning valley and thus bring the total to 560,000 tons annually.

Table X

Recapitulation

	1919 Completed	1920 Building
COKE OVENS	783	1097
BLAST FURNACES	2	12
OPEN HEARTHS	23	25
ROLLING MILLS—		
Band and Hoop	0	2
Bar	10	6
Billet	0	3
Black Plate	0	36
Blooming	2	2
Cold Mills	1	18
Plate	0	2
Shape, Merchant	1	7
Sheet	22	83
Sheet and Tin Bar	1	2
Strip	1	2
Tube	3	3
Wire	0	2
ELECTRIC FURNACES—		
Heroult	14	
Greaves-Etchells	7	
Greene	1	
Ludlum	16	
Moore	4	
Booth	1	
Rennerfelt	6	
Special	2	

Bar mill construction reflects the same influence as sheet mill construction. Automotive industries were heavy consumers of bars in 1919. The implement business last year was the heaviest yet experienced in the history of barmakers. The tonnage of bars absorbed by the forging interests during 1919 also showed a marked increase over former years. The demand still is large and threatens to keep the country's bar mills occupied until well into 1920 at least.

That the electric furnace is appealing more and more to the iron and steel industry at large, is shown by Table I. Scanning the list of manufacturers, who installed electric-melting units last year, reveals the fact that the majority are

makers of steel castings. The table shows that 53 furnaces of the various types were built last year. This number compares favorably with the number of units built during 1918, which amounted to 54. During 1917 the number of completed electric furnaces confined to the ferrous industry was 97. Records for 1916 indicate that 63 furnaces were added to the electric-melting capacity of the country while 1915 claimed only 32 new units. Therefore, from Jan. 1, 1915, to Jan. 1, 1920, about 300 furnaces have been adapted to the iron and steel industry for melting or refining purposes.

In addition to the number of new blast furnaces built during last year, attention is attracted to the number of stacks which were rebuilt along larger lines or now are being altered. Included in the former list are furnaces "E" and "F" at the Edgar Thompson works, Braddock, Pa., No. 4 at the Duquesne works, Duquesne, Pa., and No. 3 at the Farrell works, Farrell, Pa., of the Carnegie Steel Co.; No. 8 at the South works, South Chicago, Ill., of the Illinois Steel Co.; No. 4 at the National works, McKeesport, Pa., of the National Tube Co.; and Lochiel stack, E. E. Marshall, Harrisburg, Pa.

Blast furnaces now being remodeled include both stacks of the Wharton Steel Co., Wharton, N. J.; one stack each at the plants of the Crane Iron Works, Catasauqua, Pa., the Thomas Iron Co., Hokendauqua, Pa., and the Eastern Steel Co., Pottstown, Pa.; No. 5 at the Duquesne works, Duquesne, Pa., of the Carnegie Steel Co.; No. 3 at the National works, McKeesport, Pa., of the National Tube Co.; the stack of the Thomas Furnace Co., Milwaukee; and, the 100-ton stack of the Intermont Coal & Iron Corp., Big Stone Gap, Va.

Two charcoal blast furnaces were completed in 1919, one at the plant of the Mid-Continent Iron Co., Kansas City, Mo., and the other at the plant of the Bon Air Coal & Iron Corp., Lyles, Tenn. Crucible steel and muck bar capacities also were increased last year. The Ulster Iron Works, Dover, N. J., completed 11 double puddle furnaces Jan. 20, 1919, these having a capacity of 50 tons per 24 hours, while three 30-pot crucible furnaces, which have a capacity of 24 tons per day, were completed Nov. 1, 1919, by Henry Disston & Sons, Inc., Philadelphia. An innovation recorded in 1919 was the mechanical puddle furnace developed by the Lebanon Valley Iron & Steel Co., Lebanon, Pa., for producing and finishing muck bar iron.

Industry Mechanically Fit

(*Continued from Page 38*)

32,987 and are distributed in the plants of eight large steel companies.

From the foregoing it is readily apparent that roller bearings have passed the experimental stage for many uses in steel mills. At the present time the only limiting factor in their use is the size of the journal on which the bearing is to be applied. Roller bearings have not yet been applied to the necks of mill rolls but the development of such a bearing is simply a matter of carrying out the fundamental principles of roller bearings for larger journals. There is every reason to believe that within a short time roller bearings will completely supplant the old type of bearing.

Refractories in 1919

FREDERIC W. DONAHOE

Secretary of the Refractories Manufacturers Association

During the war there was such an unusual call for refractories that it was almost impossible to meet the demand for any but the lower grades.

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Must Correct Exchange Quickly, Says Europe

BY H. COLE ESTEP

European Manager, The Iron Trade Review

LONDON, Dec. 29.—British production of pig iron in 1920 is estimated by the National Federation of Iron and Steel Manufacturers at 7,290,000 tons. This compares with 9,065,617 tons in 1918, 9,420,254 tons in 1917, 9,047,983 tons in 1916, and 8,793,659 tons in 1915. Of this output, 25 per cent was foundry, 40 per cent hematite and 35 per cent basic iron.

Steel production of Great Britain in 1919 was about 7,800,000 tons. This compares with 9,561,987 tons in 1918, 9,804,079 tons in 1917, 9,196,457 tons in 1916, and 8,550,015 tons in 1915.

French iron and steel production in 1919 is indefinite. The pig iron output is estimated at about 2,000,000 tons of which about 1,000,000 tons came from Alsace-Lorraine. The official statistics on pig iron to July 1, showed a total production for all France of 1,009,428 tons of which 450,697 tons was from Alsace-Lorraine.

With due appreciation of the great obstacles that lie before them, British iron and steel makers are facing 1920 with confidence and determination. The general business recovery of the country is indicated by the official figures giving the year's capital flotations for new industrial enterprises. These showed a total of 220,000,000 pounds sterling, compared with 60,000,000 pounds sterling in 1918. The figures of 1919 include 25,000,000 pounds sterling for iron and steel works propositions.

Great Britain is in much need of American semifinished material, but the chaos that exists in exchange is limiting this business. One of the highest American diplomatic officials has said that the United States must help correct the exchange or eventually close its plants.

That the United States must awaken to the serious menace to prosperity of the present abnormal conditions of exchange and the urgent need of international action, is the old world's New Year's message to American business.

And to do this, it was not only necessary to replace the miners and plant men who had entered the service but also to increase the entire personnel of most refractories manufacturing plants. This, without doubt, had its effect upon the quality of the material produced; it was impossible to get quantity production and maintain quality with such depleted forces.

Since the signing of the armistice, however, fewer by-product coke ovens have been constructed; the production of metal has diminished; contemplated construction has been discontinued. The effect of this shortening of the demand for refractories has made itself noticeable in many ways—notably in workmanship. A representative of a large foreign steel plant made the remark in an American brick plant during November, 1919, that the silica brick in the cull pile were as good as he bought for run-of-kiln in his own country.

Plant conditions in the refractories industry have been improved during 1919—in several instances construction-work and machine installation begun in 1914 and then discontinued, were completed in 1919.

The Research Fellowship established by the Refractories Manufacturers' association entered its third year in May. This feature of the work of the association has grown to a point where the corps of "Fellows" has been increased and the laboratory space in the Mellon institute extended. More than a thousand investigations of clay, both of raw and calcined, have been made, as well as tests on finished material.

Considerable progress has been made in the way of standardizing the product, not only as regards size and shape, but quality and methods of testing to determine quality. The committee on standardization, connected with the Refractories Manufacturers' association, by constant investigation of conditions in the various industries where refractories are used, has made a gradual reduction of the special shapes that were at one time used in general practice in these industries.

Comparatively few new refractories plants have been started during the past year.

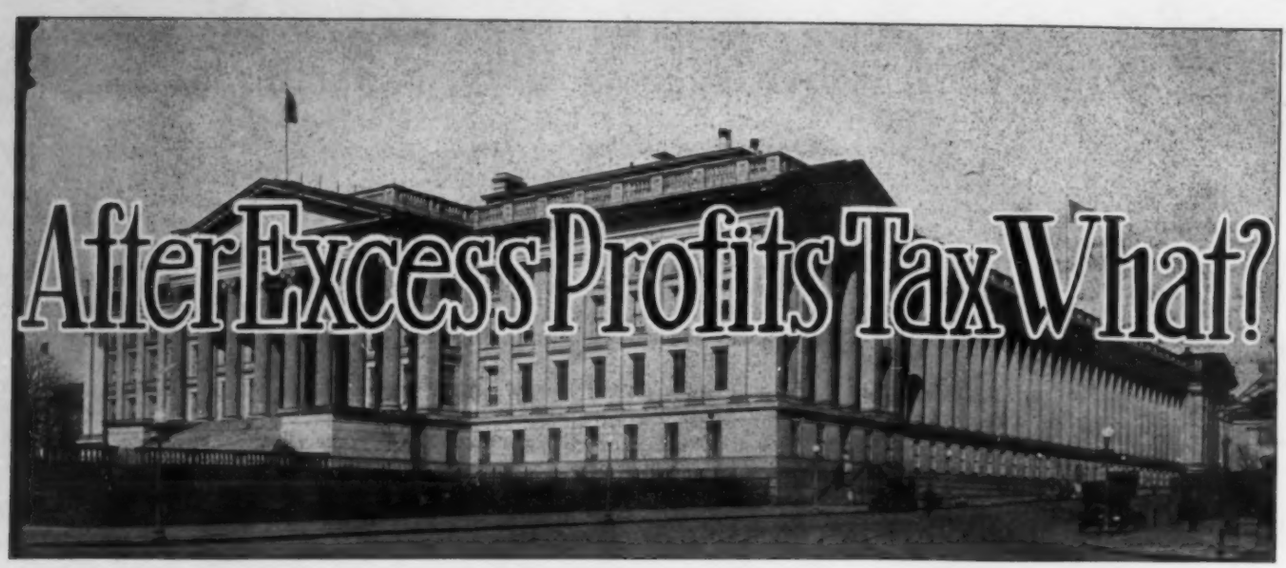
Prices Present and Past

(Yesterday, a month ago, three months ago and a year ago)

Prices are those ruling on the largest percentage of sales at the dates named.

	Prices Dec. 31, 1919	Average prices Nov. 1919	Sept. 1919	Dec. 1918
Bessemer valley, delivered, Pittsburgh	$37.40	$32.00	$29.35	$36.60
Basic, valley, delivered, Pittsburgh	36.40	30.40	27.15	34.40
*No. 2 Foundry, Pittsburgh	39.40	33.15	28.15	35.40
*No. 2 Foundry, Chicago, furnace	40.00	31.75	26.75	34.00
Lake Superior charcoal, Chicago	45.00	35.50	32.75	38.70
Malleable, valley	39.65	31.75	28.65	35.90
Malleable, Chicago	40.50	32.25	27.25	31.50
*Southern, No. 2, Birmingham	35.50	30.65	26.75	35.25
*Southern Ohio, No. 2, Ironton	38.00	31.75	26.75	34.00
Basic, eastern del., eastern Pa.	40.00	33.00	27.00	36.90
**No. 2X, Virginia, furnace	41.25	33.40	29.25	38.00
*No. 2X, eastern del., Philadelphia	40.70	35.85	29.95	39.15
Gray forge, valley del., Pittsburgh	38.40	31.80	27.15	34.40
Ferromanganese, 80 per cent, delivered	130.00	110.00	105.00	240.00†
Bessemer billets, Pittsburgh	48.00	40.90	38.50	47.50
Bessemer sheet bars, Pittsburgh	51.00	45.00	42.00	51.00
Open-hearth sheet bars, Pittsburgh	51.00	45.00	42.00	51.00
Open-hearth billets, Pittsburgh	48.00	40.90	38.50	47.50
Steel bars, Pittsburgh	3.00	2.45	2.35	2.90
Steel bars, Chicago	2.62	2.62	2.62	3.17
Iron bars, Philadelphia	3.495	2.895	2.595	3.745
Iron bars, Cleveland	$3.25	$3.00	$2.52	$3.64
Iron bars, Chicago mill	2.87	2.73	2.62	3.50
Beams, Chicago	2.72	2.72	2.72	3.27
Beams, Pittsburgh	2.50	2.45	2.45	3.00
Beams, Philadelphia	2.795	2.695	2.695	3.245
Tank plates, Pittsburgh	2.75	2.65	2.60	3.25
Tank plates, Chicago	2.92	2.92	2.92	3.52
Tank plates, Philadelphia	3.245	2.895	2.845	3.395
Sheets, blk., No. 28, Pittsburgh	5.00	4.35	4.35	5.00
Sheets, blue annld., No. 10, Pittsburgh	3.75	3.55	3.55	4.25
Sheets, galv., No. 28, Pittsburgh	6.25	5.70	5.70	6.25
Wire nails, Pittsburgh	4.25	3.45	3.25	3.50
Connellsville furnace coke	6.00	5.80	4 60	6.00
Connellsville foundry coke	7.00	6.95	5.90	7.00
Heavy melting steel, Pittsburgh	25.00	21.90	20.50	27.50
Heavy melting steel, eastern Pa.	23.00	20.80	19.00	24.75
Heavy melting steel, Chicago	22.50	20.65	19.00	26.50
No. 1 wrought, eastern Pennsylvania	31.00	27.85	27.00	33.50
No. 1 wrought, Chicago	27.00	26.50	21.25	29.65
Rerolling rails, Chicago	32.00	31.15	25.40	30.40

*1.75 to 2.25 silicon. **2.25 to 2.75 silicon. †70 per cent.



Government at a Loss for Revenue Policy to Replace Onerous War Taxation System —Big Factor in Business Prosperity and Cost of Living—Future Treasury Needs to Keep Imports High for Years

BY JOHN W. HILL

OF THE host of great problems pressing upon the country for solution none is more supremely urgent than that of replacing the present onerous system of taxation by a comprehensive revenue policy adjusted to peacetime conditions. The prime defect of the present law is the excess profits tax which stands condemned before the nation both because it imposes oppressive and unjust burdens upon business and because it is becoming recognized as a dominant factor in keeping the cost of living in the skies.

President Wilson in his message to congress early in December and former Secretary of the Treasury Glass in his annual report, both urged repeal of the excess profits tax, but pointed out it would be fatal to reduce the total revenue impost for the next fiscal year.

Even congress is conscious of the act's monumental inequities yet in view of the treasury's appalling requirements and the current year's threatened deficit, it hesitates to attempt any reforms because of a lack of adequate revenue devices which might be substituted for it. Chairman Fordney of the house ways and means committee, however, is on record as favoring the repeal of the excess profits tax "as soon as conditions justify the same." He has requested considerable data from the internal revenue commissioner and when this is at hand it is announced he "is hopeful that the committee will be able to work some beneficial changes in the revenue laws."

The committee faces a stupendous task. Not only must it relieve business from the great burden placed upon it by the present law but at the same time it must find means to provide for the future ordinary financial needs of the government which, measured by prewar standards, are certain to attain tremendous proportions.

The task is rendered even more perplexing in the face of the treasury department's recent estimate that the deficit for the current year ending June 30 would be about $3,905,888,528, while estimated expenditures for the fiscal year of 1921 stand at $4,865,410,000, with a probable deficit for that year of $2,009,336,000. Consequently reduction in the aggregate revenues is inconceivable.

The expenditures for the year beginning July 1, 1920, will contain a new item, that of a sinking fund of $287,500,000 on the public debt, required by the Victory Liberty note bill. This provision for annual amortization of 2½ per cent of the debt, less the amount of allied loans, will spread the liquidation of the total war bonds over almost 50 years. The annual interest requirements beginning with 1921 will be $1,017,500,000, an item more in itself than the entire annual expenditures for any year previous to the war.

The treasury's annual report settled a mystery that had surrounded the interest payments by the allies on their nearly $10,000,000,000 debt in this country. Mr. Glass in this connection said that the government is considering funding the interest for two or three years or during the reconstruction period and at the same time funding the demand obligations which the United States now holds into long time obligations.

The gross public debt on Oct. 31 was $26,210,530,000, without deductions for loans to the allies or other investments. Of this sum only $3,736,352,000 was in the form of floating debt. Of the total cost of the war of $35,415,000,000 Mr. Glass said $11,000,000,000 or 32 per cent had been raised by taxes.

In view of the reduction in the schedules for 1919 under those of 1918 together with the loss in revenues occasioned by prohibition, some authorities firmly maintain that the treasury will be disappointed in its expectations of receiving $5,200,000,000 in revenues from the tax law, including $4,900,000,000 in excess profits and income taxes and $260,000,000 from customs. They fix $3,250,000,000 at the outside as the probable returns. The 1919 revenue act abolished the 80 per cent war tax provision of the 1917 law and reduced the excess profits rates for 1919 and subsequent years from 30 to 20 per cent in the first bracket and from 65 to 40 per cent in the second bracket making a reduction in the estimated total collections of 25 per cent.

Total expenditures of the govern-

ment from the declaration of independence to the beginning of the war amounted to $25,500,000,000. The net cost of its two years of participation in the world war to the United States was $35,415,000,000. During the 52 years between 1866 and 1917 the net excess of revenue over outgo was $2,147,686,439 and during all that time only $636,554,220 of direct taxes were collected. The terrific tax burden imposed by the war is revealed by the fact that the gigantic sum of $11,000,000,000 represents the contribution from current revenues to the war cost and thus in the brief period of three years the people have borne an enormous tax burden of more than 16 times that for the preceding half century. In 1909 only 52,498 corporations made tax returns as compared with 232,079 in 1917 the latter representing an increase of 344 per cent. The number of persons making returns in 1913 was 1,357,598 as against 3,472,890 in 1917. The tremendous tax weight which has been bequeathed American business by the war is revealed by the fact that in 1914 a total of 174,205 corporations, with taxable incomes, paid an aggregate income tax of $60,710,-197, or an average of $342 each, while in 1917 a total of 232,079 corporations, with taxable incomes, paid an aggregate income and excess profits tax of $2,142,445,769, or an average of $9231 each. The gain in the three years was 2599 per cent and in the 1918 and 1919 calender years the increase will be of even greater proportions. It could not be possible that this astounding increase in taxation borne by companies earning profits could escape reflection in prices.

Increased Price Factor in Prices Shown

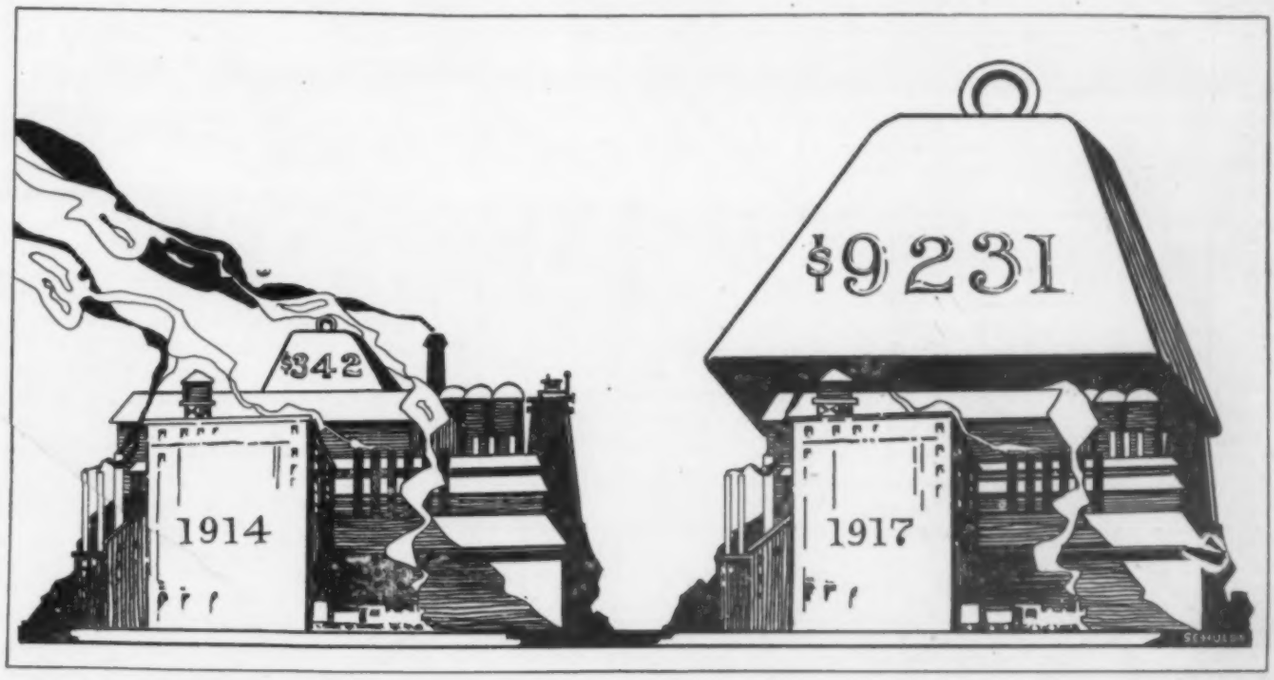
Corporation With $1,000,000 Invested Capital

Taxable net income	Income and profits taxes	Net income after taxes	Percentage of net return on invested capital	Percentage increase in selling prices of commodities necessitated by tax*
$ 25,000	$ 2,300	$ 22,700	2.27	0.38
50,000	4,800	45,200	4.52	0.80
75,000	7 300	67,700	6.77	1.22
100,000	12,860	87,140	8.71	2.14
125.000	19,860	105,140	10.51	3.31
150,000	26,860	123,140	12.31	4.48
175.000	33,860	141,140	14.11	5.64
200,000	40,860	159,140	15.91	6.81
250,000	63,860	186,140	18.61	10.64
300.000	86,860	213,140	21.31	14.48
350.000	109 860	240,140	24.01	18.31
400,000	132,860	267,140	26.71	22.14
450,000	155,860	294,140	29.41	25.98

*Based upon assumed gross sales of $600,000 or 60 per cent of invested capital, this $600,000 to be increased by amount of tax.

With the annual interest on the war debt in excess of the entire federal expenses before the war, together with an expanded military establishment, higher postal and other salaries, and inevitably increased expenses in every department of government, it will be seen that the annual tax load of the nation will remain for years on a scale not dreamed of before the war.

Interesting facts regarding the tax factor in iron and steel prices are to be found in the records of the United States Steel Corporation which are typical of the industry as a whole. In 1913 the corporation's total domestic and foreign shipments aggregated 12,168,-758 net tons of finished material for which it received $518,999,605 making an approximate average sale price per ton of $42. In 1918 the corporation shipped 14,124,986 tons, gross sales



THE AVERAGE TAX BURDEN IMPOSED UPON AMERICAN CORPORATIONS REPORTING INCOMES GREW FROM $342 IN 1914 TO $9231 IN 1917—AN INCREASE OF 2599 PER CENT

reaching $1,288,029,255, and averaging approximately $91 per ton or $49 per ton above the 1913 average price.

Analysis of the division of this increase shows that $19 of the $49 or 39 per cent went to excess profits taxes; $17 or 35 per cent to increased wages; $9 or 18 per cent to increased depreciation charges and higher operating expenses while only $4 or 8 per cent represented the growth in the amount available for dividends.

This showing provides an illuminating commentary upon the underlying causes of the higher prices for steel products and establishes beyond dispute the fact that responsibility rests upon increased taxation and labor charges, while augmented returns on capital constitute an amazingly unimportant factor in the situation. It is interesting to note that a recent survey in England showed that of the increased costs of certain articles, labor had received 57 per cent, the state through taxation 40 per cent and capital 3 per cent.

Responsibility Placed on Business

The excess profits tax in the last analysis is a commodity tax, responsibility for the collection of which the government has thrown upon business. As the aim of business is to maintain a constant volume of earnings the tax becomes an item of cost and is added to the price of the product market. How this operation would work out with a corporation having $1,000,000 invested capital and gross sales of $600,000 annually is shown in the accompanying table of possible earnings.

Tax Has Accumulative Effect

This picture, however, does not give an adequate idea of the actual effect on prices to the ultimate consumer. Most articles before reaching the hands of the consumer pass through four or five different hands, including producer of raw material, manufacturer, jobber and retailer and each party in this scheme of production or service must make adequate allowance to cover his taxes. The result is that the tax is figured into the selling price by each member of the distributive chain and, growing like a snow ball rolling down hill, is augmented 300 or 400 per cent before the final purchaser is reached. Another phase of the situation is pointed out by Douglass S. Meaden, of Hubbell & Meaden, federal tax consultants of Cleveland, who says:

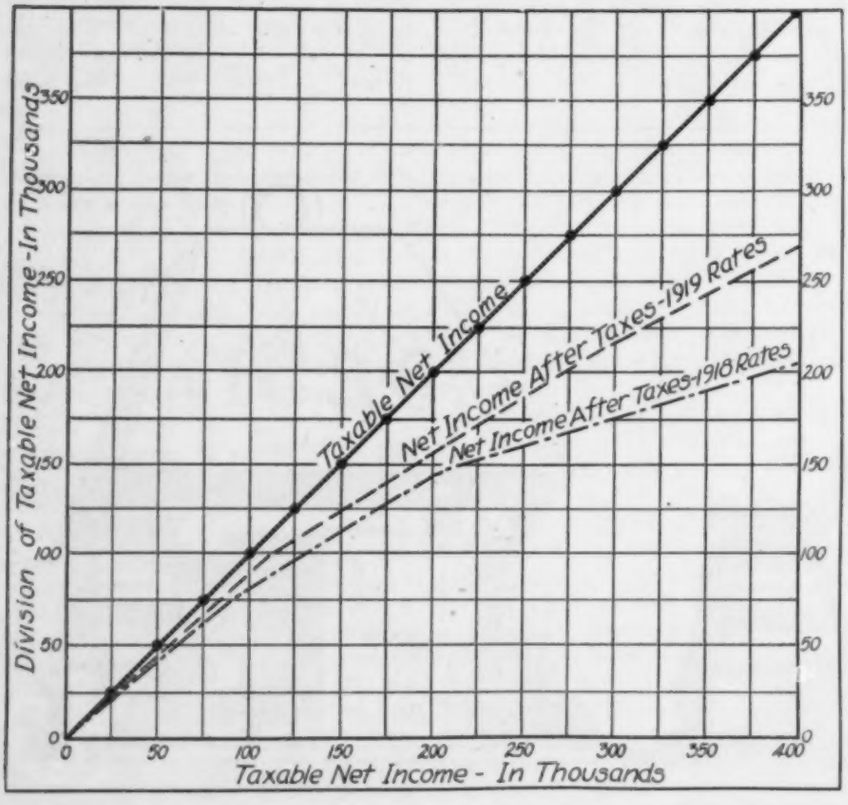
"As the revenue act of 1918 did not become a law until Feb. 24, 1919, a great many corporations found it impossible to properly provide for federal taxes in the year in which they accrued. Some corporations endeavored to play safe by creating reserves estimated to be excessive rather than too small. One large steel corporation reserved out of 1918 earnings more than 20 per cent of its gross sales for account of federal taxes. That means the selling prices of its commodities were 25 per cent higher than necessary to earn the same returns had there been no such tax, and 20 per cent higher than if a straight tax of 10 per cent on net income had been levied. Some corporations made little or no provision for the federal taxes on 1918 income with the result that charges for the tax levy are deducted from 1919 earnings making the prices for their commodities much higher at present than the prices possible under a lower tax rate."

William B. Colver, of the federal trade commission, charges that the excess profits levy "boosts costs, raises prices, halts production, breeds waste, extravagance and inefficient business methods." He adds: "When a concern has reached beyond what is considered to be its normal profitableness the surplus is partially taken away from it in increasing percentages. What follows? Waste and extravagance; or an effort to make as much profit with the excess profits tax in operation as though it were not in operation and that is done by charging excess profits tax to costs. It means the collection from all the people, when the 60 per cent excess profits tax rate has been reached, of a dollar, unnecessarily, in order that 40 per cent may be added to divisible profit."

Other critics have complained that the tax hits hardest the corporation with small or moderate capitalization and that enterprise, mechanical ingenuity and initiative are penalized so that if a small firm does a large business on a small capitalization the tax almost wipes it out. Consequently there no longer is any necessity to employ accumulated profits in the business without capitalizing them, but on the contrary there is every inducement to capitalize every justifiable item and this makes for higher costs. Furthermore because costs are deducted before taxable profits are arrived at under the operation of the excess profits tax there is no inducement to keep costs down as much as possible but in fact rather the reverse.

Urges Repeal of Tax

At the recent annual convention of the Investment Bankers' Association of America in St. Louis the organization tax committee presented an exhaustive report on the revenue prob-



HOW THE NET INCOME OF A CORPORATION WITH $100,000 INVESTED CAPITAL COMPARES AFTER 1918 AND 1919 TAXES HAVE BEEN PAID

lem in which it reached the conclusion that "though many changes in the tax laws are necessary, the first is the repeal of the excess profits tax" which the committee declared, was the paramount tax issue before the country. The committee's report in which it enumerates some of the chief counts in the indictment against the excess profits tax follows:

"The excess profits provisions stand as a menace to our reconstruction program. Based as it is upon the accidental methods of capitalization before the war and the corporate reconstructions that have taken place since its enactment, it imposes unjust discrimination between the individual, partnership and corporate methods of conducting business. For instance, even under the reduced rate provisions for the tax year 1919 and based on a moderate amount invested, the tax of a stockholder in a corporation producing 25 per cent net earnings would be nearly three times that of an individual doing business alone on the same capital or having the same capital invested in a partnership. The net earnings in all three cases are alike. In this case the tax will cost the stockholder 6.8 per cent on his capital and the individual or partner 2.8 per cent. Business cannot stand such unequal burdens in peace times. The tax is discriminatory in favor of old and against new enterprises. The older and well established concerns making good profits before the war are not so materially affected under the act as new enterprises."

So it seems that the United States stands upon the threshold of the most critical industrial period of its entire history utterly devoid of a definite peacetime revenue policy. A number of purported solutions of the revenue riddle have been offered among them being suggestions for a straight graduated tax upon personal incomes and for a tax upon commodities and luxuries. The former would place the tax burden entirely upon individual incomes and is sure to be bitterly opposed, while the latter is not likely to be enthusiastically greeted as a solution by congress, which is still vividly conscious of the public's reception of the 1918 luxury taxes.

The recommendation offered by Former Secretary Glass in his annual report for "an increase of the normal income tax and of the lower brackets of the surtax," has attracted widespread attention. It will be necessary to fall back upon these revenue sources, he says, in order to replace those sacrificed by the elimination or reduction of the excess profits tax, which he denounced as unsuitable as a "war expedient" and doubly objectionable as a peacetime tax measure. He pointed out that the uppermost brackets of the surtax have already passed the point of productivity. In addition he recommended that congress take steps to prevent evasion of taxes by the rich through investment in state and municipal securities.

The belief is growing among the most intelligent observers that the most sensible thing to do in the circumstances would be to appoint a nonpartisan committee to devote intensive study to the problem and to report a solution. This course pursued in England resulted in a budget recommendation for a reduction of the war profits tax of 50 per cent. Certainly the problem is too important and too vital to industry to permit of any further blundering or eleventh hour action, to which the revenue policy of the government was subjected during the war. In connection with no other national problem is it more imperative that careful and deliberate consideration be given to the solution.

Recent outgivings of congressional leaders indicate they are keenly alive to the necessity of keeping appropriations within as reasonable bounds as possible in the circumstances. Republican Leader Mondell of the house declares that estimates of 1920 needs by government bureaus and departments aggregate $6,000,000,000, including $613,000,000 on account of the railroads. The army alone wants nearly $1,000,000,000. Representative Mondell predicted that the total estimates would be pared by at least $1,000,000,000, a process that would be greatly aided by the adoption of the federal budget plan a bill providing for which has already been approved by the house

OF THE $49 ADVANCE IN 1918 OVER 1913 IN THE AVERAGE PRICE PER TON OF FINISHED STEEL SOLD BY UNITED STATES STEEL CORP., INCREASED TAXES RECEIVED $19, INCREASED WAGES $17, HIGHER OPERATING EXPENSES $9, WHILE BUT $4 WENT FOR ADDITIONAL DIVIDENDS

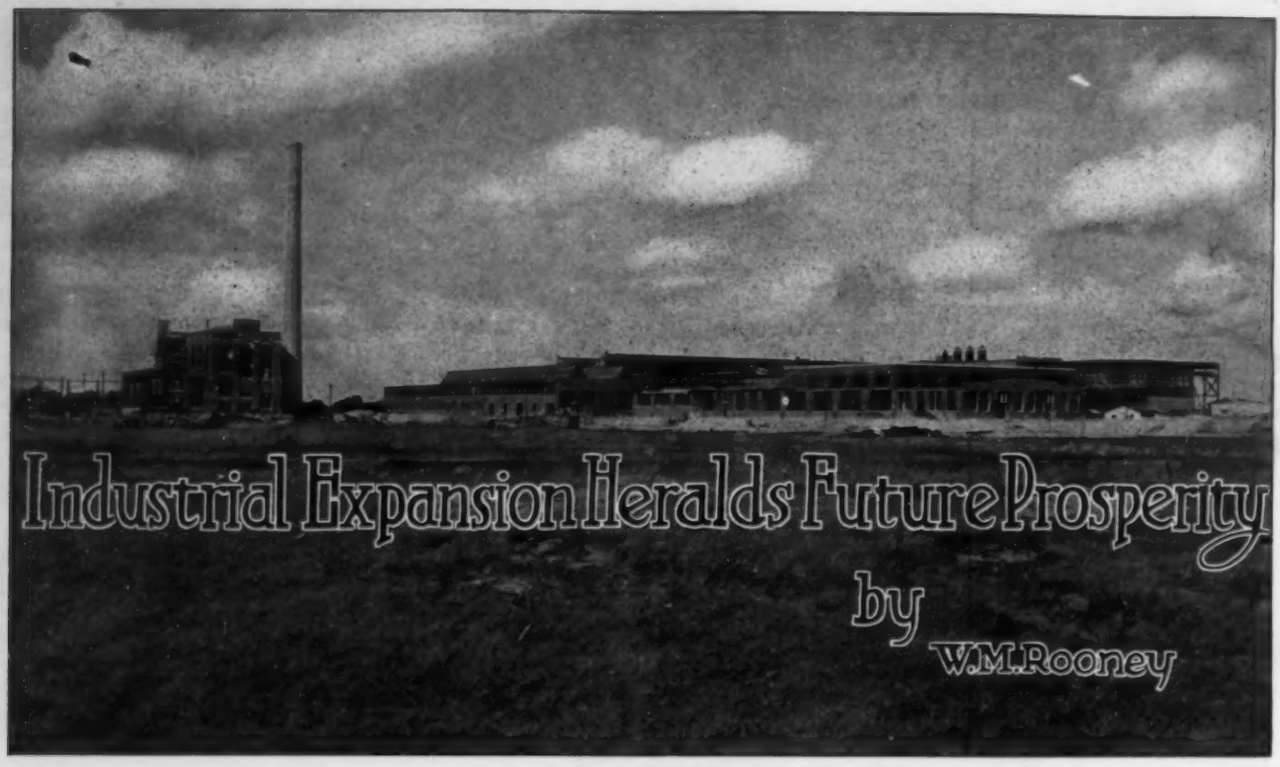


Fig. 1—Gray iron foundry of the Saginaw Products Co. erected by Frank D. Chase, Inc., which is designed and built along most modern industrial lines

DESPITE labor unrest, scarcity of materials and obstacles of other kinds, American industries, in 1919, established a record of expansion never equaled in any one year since the birth of the nation. Millions in additional capital have been invested to increase the output of American goods; hundreds of new corporations have launched into actual production and, at the beginning of 1920, American manufacturing institutions find themselves as never before in a position to place American-made goods in the markets of every country on the globe.

Nov. 11, 1918, found these industries working at top speed producing the material with which to drive Germany from her "place in the sun," and it was with something of a shock that the news was received that the war was over and peacetime methods of business were to be restored. For more than four years and particularly during the last two, these plants had given little thought to expansion, except to that which was absolutely necessary. In fact most expansion of this character during the war was financed by the government. As a result, many extensive plans privately created had been laid aside until the war was won. But with this task accomplished these plans were again taken up and before many months suspended programs were moving toward execution.

No criterion better can illustrate the expansion of capacity during 1919 than the number of new metalworking plants and additions erected during the year. Even the most pessimistic observer after a casual survey of the figures, is forced to admit that never in history have so many individual projects been started and such an amount of money been expended in a single year. When to the expansion in metalworking lines that of other industries is added, an astonishing result is shown by the amount of construction done during the year.

Practically every branch of the metalworking industry was extended during 1919, but this expansion was marked chiefly in the automobile industry where millions were invested by the automobile and automobile parts manufacturers. From Jan. 1 to Nov. 1, approximately 6264 distinct industrial building projects were started, which exceeds the number initiated in 1918 by 1348.

Volume is Tremendous

During the first four months following the signing of the armistice, building was practically at a standstill. Some construction was going on, but compared with former years, the erection of plants and additions was practically nil. Almost overnight this condition changed and construction companies soon found themselves working at a tremendous rate and unable to fill the contracts on their books. Added to the almost overwhelming number of contracts, the construction firms had to contend with numerous obstacles, which to some extent were released as the year advanced, but nevertheless played a part in the industry the entire period.

Some idea of the extent of the work done during the year by the construction and engineering companies of the country is afforded by figures compiled by the F. W. Dodge Co., New York These statistics show the value of contracts for all kinds of building operations, including residences, business, public service and industrial construction, awarded from Jan. 1 to Dec. 1, and tell a complete story in themselves. They are compared with figures for previous years. They follow:

AWARDS FROM JAN. 1 TO DEC. 1

1919	$2,332,902,000
1918	1,631,929,000
1917	1,527,370,000
1916	1,243,998,397
1915	857,190,100
1914	677,920,300
1913	798,117,500
1912	803,391,500
1911	735,283,813
1910	756,284,931

NEW ENGLAND

1919	$207,288,000
1918	142,615,000
1917	193,343,000
1916	193,779,000
1915	163,776,000
1914	262,732,000
1913	159,740,000
1912	186,963,000
1911	162,535,000
1910	149,715,000
1909	149,553,000
1908	100,037,000
1907	123,687,000
1906	116,032,000
1905	101,670,000
1904	90,800,000
1903	96,676,000
1902	109,734,000
1901	113,102,000

NEW YORK AND NORTHERN NEW JERSEY

1919	$503,729,000
1918	249,188,000

1917	316,014,000
1916	255,381,500
1915	155,154,500
1914	121,598,000
1913	235,694,500
1912	211,282,500
1911	215,839,500
1910	233,081,000
PHILADELPHIA, BALTIMORE AND WASHINGTON	
1919	$359,747,000
1918	388,455,000
1917	204,654,000
1916	150,046,000
1915	90,905,000
1914	81,195,000
1913	83,441,000
1912	132,691,000
1911	96,173,000
1910	91,934,000
PITTSBURGH	
1919	$383,322,000
1918	343,509,000
1917	192,983,000
1916	156,564,000
1915	111,562,000
1914	125,831,000
1913	145,853,000
1912	108,505,000
1911	120,674,000
1910	100,395,000
CENTRAL WEST	
1919	$820,506,000
1918	474,609,000
1917	573,762,000
1916	424,231,897
1915	280,601,600
1914	196,564,300
1913	173,389,000
1912	163,950,000
1911	140,062,313
1910	181,159,931
NORTHWEST	
1919	$58,310,000
1918	33,553,000
1917	46,614,000
1916	63,996,000
1915	55,191,000

Of the total expended in 1919 approximately 12 per cent was for metalworking plants. As a gage to the amount of construction done during the year by the metalworking industry, the figures compiled by the Dodge Co. from July 1 to Dec. 1 must be considered. During this period in the territory north of the Ohio and east of the Missouri rivers, industrial building contracts amounted to $309,041,908, which figure has been exceeded but once and that in 1918, when great and numerous plant enlargements, financed by the government and erected for war purposes only, were under construction. Of this amount approximately $46,443,820 was expended for metalworking plants.

In the New England district industrial building contracts during the period amounted to $36,724,185 and of this total more than $5,540,785 was for metalworking plants. In New York state and northern New Jersey total industrial contracts awarded from July 1 to Dec. 1 amounted to $45,161,389 of which more than $8,978,935 was expended for metalworking purposes. In the Philadelphia, Baltimore and Washington district industrial building awards from July 1 to Dec. 1 amounted to $30,863,394 of which more than $7,970,800 was by the metalworking industry. Awards in the Pittsburgh district during the five month period totaled $78,289,840. Of this amount more than $23,683,800 was for metalworking plants.

In the Central west district, which includes Illinois, Indiana, Iowa, Wisconsin, Michigan and parts of eastern Missouri and Kansas, industrial awards during the period amounted to $106,934,100 which is greater than the high record established in 1917. Of these awards more than $34,362,090 was expended for metalworking buildings. Industrial awards in the states of Minnesota, North and South Dakota during the period totaled $4,032,000 and the portion for metalworking plants was more than $269,500.

Expenditures for all kinds of construction in all districts from Jan. 1 to Dec. 1, totaled more than $2,333,902,000. Approximately $309,041,908 of this was expended for industrial buildings. It has been estimated that $250,525,910 was paid out for the construction of plants and plant additions in the metalworking industry.

These figures, although only aproximate, show the enormous expansion which has taken place during the year and are a gage to the program being pursued by the industrial institutions of the country to reach maximum production if possible in 1920.

Standardized Construction Gains

Standardization in all lines of manufacture has been advocated for years but not until the last few has standardization of industrial buildings been recognized as a factor in increased production. During 1919 the tendency toward the erection of industrial buildings along standardized lines, was noted by the similarity of construction for companies engaged in the same lines of effort.

It is an accepted fact that a type of building which has proved its value to one machine shop, foundry or metalworking plant, will be just as valuable and as useful for the purpose of another, and builders and contractors working along this line, have developed types of buildings which are best suited to the work to be done in them. As a result of this movement, practically three types of buildings are being erected in this country today. The first type is well adapted to the needs of heavy metalworking plants and large foundries and is of steel and concrete or brick construction. No unique features are at-

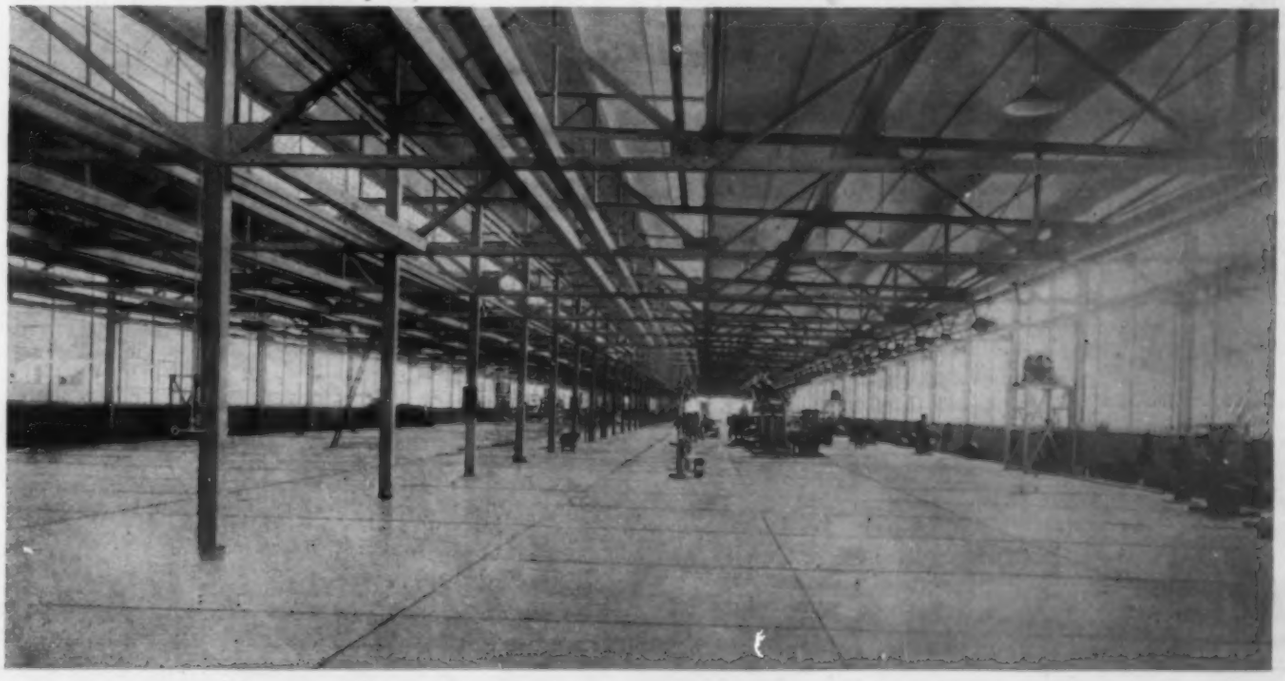
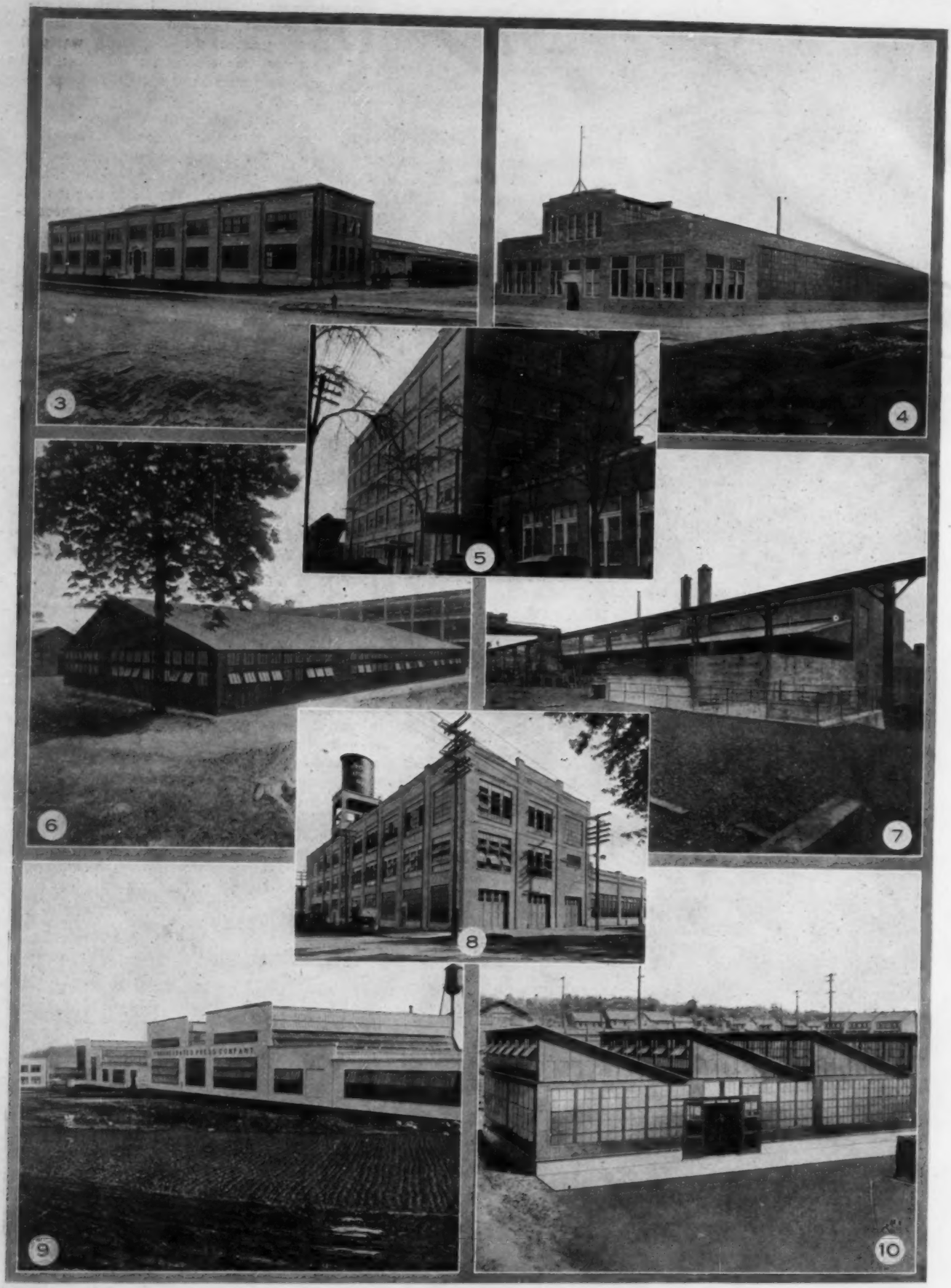


FIG. 2—LIGHTING OF A PLANT HAS MUCH TO DO WITH THE QUANTITY AND QUALITY OF THE PRODUCTS TURNED OUT. THIS ILLUSTRATION SHOWS A WELL LIGHTED MACHINE SHOP ERECTED BY THE AUSTIN CO



VIEWS OF VARIOUS TYPES OF METALWORKING PLANTS WHICH ILLUSTRATE THE CHARACTER OF INDUSTRIAL CONSTRUCTION CARRIED OUT DURING THE PAST YEAR

tached to structures of this kind, other than that the buildings are the last item considered in the establishment of a plant. In this type of structure a complete layout of equipment is made before any thought whatever is given to the construction of the buildings. When the layout plans have been completed to the satisfaction of the owner, the contractor then erects the building, or as it were, puts the shell on the plant.

For smaller foundries and machine shops the tendency in construction has been toward structures of structural steel and brick. This is because a steel-frame building is well adapted to supporting cranes and monorail carriers and gives longer spans of clear floor area than can be obtained in other types. For lighter manufacturing, the preference of manufacturers during the year was divided between reinforced concrete flat slab construction and ordinary mill construction of wood and brick.

The second type of building is that built along well standardized lines, such as that erected by the Austin Co., Cleveland. This type of construction is generally of brick and steel and is well adapted to all lines of manufacture. This type is suited to the manufacturer who is planning on future extension, as additions can be added without delay to production. Such structures are standardized along lines which provide generous means for light and ventilation and the supporting columns are laid out in such a way as to provide freedom of layout, while the sturdy construction is equal to the strain imposed on them by cranes, monorails, etc.

The third type is that of the standard unit building, such as erected by the Truscon Steel Co., Youngstown, O. These buildings are practically fabricated structures, all parts being made at the plant and shipped to the site of construction, ready for immediate erection. During the war in many cases they were of incalculable value because of the short time in which they could be erected—approximately six weeks from date of order. It is estimated that about 10,000 square feet of floor area can be made ready for occupation by 20 men in eight or 10 days. There are about 7½ to 8 pounds of steel per square foot of floor space, in the monitor type, and in the sawtooth type there are about 10 pounds of steel per square foot. Buildings of this type can be erected on either concrete or wood foundations. Structures of this type can be razed and moved from one site to another, with practically no loss in salvage.

Each manufacturer of course has his ideas as to how a plant should be constructed, but from the types being erected it is apparent that manufacturers have accepted the standard building construction on a large scale. Some types of construction, which were popular during 1919, are shown by the accompanying illustrations.

The plant of the Samson Tractor Co., Janesville, Wis., is shown in Fig. 3. This is unit one of the plant, and consists of a 1-story machine shop, 200 x 500 feet, a 2-story office building, 40 x 216 feet, a 1-story boiler house, 37 x 40 feet, a 1-story coal storage building, 16 x 51 feet and other structures. The building shown is that of the office and machine shop. The machine shop is of steel sawtooth construction with brick walls, steel sash, asphalt block floors, cement roofing tile and prepared roofing.

In Fig. 4 a modern brick and steel

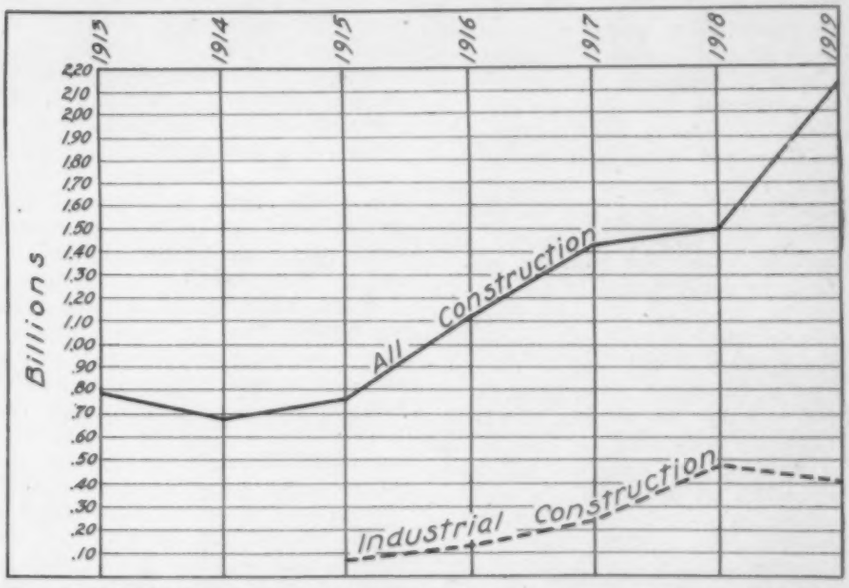


FIG. 11—CHART SHOWS TREND OF ALL CONSTRUCTION FROM 1913 TO 1919, AND INDUSTRIAL CONSTRUCTION FROM 1915 TO 1919. ALTHOUGH THE AMOUNT OF INDUSTRIAL CONSTRUCTION DROPPED IN 1919 FROM THAT OF 1918, THIS IS OFFSET BY THE INCREASED NUMBER OF INDUSTRIAL PROJECTS DURING THE YEAR COMPARED WITH 1918

structure is shown. This was erected for the Bryant Mfg. Co., Chicago, by the Austin Co., Cleveland. This building is a No. 2 Austin standard building, and is 90 x 280 feet. Sufficient light and ventilation is afforded by a building of this type.

The illustration shown in Fig. 5, is that of the plant of Chicago Pneumatic Tool Co., Detroit, which was erected by Westinghouse, Church, Kerr & Co., New York. This building is typical of large finishing plant and machine shop construction, as well as being adapted to the use of automotive and other finishing industries.

The sawtooth type of standard building, as erected by the Truscon Steel Co., Youngstown, O., is shown in Fig. 10. This building was erected by the Truscon Co. for its own use, and is now being used as a machine shop. Another type of standardized building is shown in Fig. 6. These buildings were erected at the plant of the Paige-Detroit Motor Car Co., Detroit, by the Truscon Steel Co. The building in the foreground is 80 x 156 feet.

A type of construction which has been in demand is shown in Fig. 7. This building was erected by the Austin Co., Cleveland, for the Busch-Selzer Diezel Engine Co., St. Louis. This structure is of special size, being 137 x 184 feet, and is of brick and steel construction.

Fig. 8 is that of the Jackson-Church-Wilcox Co., Saginaw, Mich., which also was erected by Frank D. Chase, Inc. The layout of this building consists of a 3-story reinforced concrete building, 67 x 207 feet, and is of reinforced concrete, steel, brick, steel sash, gypsum roof tile, construction.

The newly erected plant of the Consolidated Press Co., Hastings, Mich., erected by Frank D. Chase, Inc., Chicago, is shown in Fig. 9. This plant consists of a machine shop, one-story, 150 x 302 feet, of enameled brick and steel construction, has pond continuous top hung and pivoted steel sash, tile roof, concrete floor throughout and is 40 feet 10 inches to bottom of truss in section with craneway. The office building of this plant is a 2-story structure, 49 x 97 feet, of mill construction, white enamel brick, and is connected to the machine shop by a covered bridge. This type of plant is thought by many to be a model of architectural beauty.

Large foundry construction, is shown by Fig. 12. This is the plant of the Vulcan Products Co., and was erected by Westinghouse, Church, Kerr & Co. This structure is mod-

ernly equipped and built in the most aproved style for the production of large castings. It is well lighted and ventilated.

Time was when foundries, machine shops and metalworking plants were housed in buildings often least suited to their needs and for their purposes. This was due to the fact little thought was given to scientific lines of construction and, any building, no matter be it an abandoned barn or a business structure so long as it afforded the space, was accepted as suitable for the needs of the manufacturer.

Light and Air Sought

Such is not the case today. Many and varied are the demands placed on the contractors by prospective builders. More thought is given to light and ventilation in the erection of buildings by manufacturers, than ever before. Demands of industry call for light, airy buildings and it has been proved that only in plants well ventilated and well lighted, can the best and the greatest amount of work be turned out. The daylight scheme has been the greatest factor in the revolution, if revolution it can be termed, in the construction of modern plants. Production today demands plenty of light and on the other hand modern health conservation dictates the necessity for sufficient ventilation. Practically every plant now being erected is provided with restrooms, clubrooms, etc., which are recognized as a necessary adjunct to working space. The larger plants are provided with drinking fountains in various places, where workmen can relieve their thirst without running to the far end of the shop in order to do so. Some thought is also given to architectural beauty many plants being models in this respect.

Builders have realized that layout of equipment is of prime importance in plant construction and have developed plant types along lines, which insure greater convenience, to workmen and machines, less loss of time, and therefore, greater production.

One of the striking developments of the year is that shown by the plans of the manufacturer for enlarged capacity and the anticipation of still greater production in the future. Plants formerly were built for specific needs. They still are, but provision is now made for future layouts in the original plans. Plans for a foundry at Saginaw, Mich., for the General Motors Corp., which was planned and built by Frank D. Chase, Inc., Chicago, and is one of the most modernly equipped and constructed plants in the country call for future and ultimate construction. In the erection of this plant, before erection was started, plans not only were drawn for the buildings to be started immediately, but also for future structures to be undertaken when demands required.

This scheme of planning for the future is practically a new development and, is one that has gained in favor greatly during the past year. Manufacturers have recognized the saving, both in time and money, afforded by the preparation of such plans and, realize that in this way additions to old plants can be erected along lines similar to the parent buildings. The plant as a whole therefore retains similarity of appearance in all its parts and retains the desired appearance of construction and convenience of plant layout.

In the expansion of industry along construction lines, the metalworking industry has taken the lead and, in this industry, the manufacture of automobiles has played the most extensive part. The ban on the manufacture of pleasure automobiles was lifted shortly after the signing of the armistice and immediately practically all manufacturers of this class in the country, laid plans to turn out large numbers of cars. To a great extent they have fulfilled their aims but it is apparent they have not kept up with the demand for their products. The expansion in the automobile industry called forth enlargements in other metalworking pursuits and this especially was noticeable in the erection of new foundries. While the country has seen no greater year in industrial building than that of 1919, 1920 looms as likely to break all records. Many manufacturers who have delayed construction of new plants and additions in the hope of lower prices, are planning to go ahead with these plans as soon as possible. Many of the powerful corporations of the country have laid aside large appropriations to finance proposed building expansion and, plans are maturing actively for the formation of new companies, which undoubtedly will erect new plants.

As an index to the proposed industrial activity of the future, the district about Detroit is striking. Statistics show that appropriations there totaling $84,400,000 have been made for new construction and during the year which has elapsed, that district's industrial and financial interests have initiated construction programs involving no less than $100,000,000. In the Cleveland district, another automobile center, a similar though more moderate expansion is recorded.

Record Expansion During Year

During the year, according to a leading industrial engineer, industrial construction for the first few months was largely confined to the central west. Toward the latter part of the year, however, the eastern section of the country awoke, and construction activities in that section were progressing at a fair rate when 1920 began.

Contractors and engineers state that although more money was expended on industrial projects in 1918 than in 1919, during the latter year more individual projects were placed under construction. This, they point out, is an index to the effort made by manufacturers to fill the demand for their goods. They further state that although the year's expansion was enormous, it has not been sufficient.

Undoubtedly 1919 was a wonderful year of expansion, despite labor unrest, shortage of materials and other complications, which are the inevitable aftermath of war. As 1920 begins labor conditions, the greatest obstacle of all, while still dubious, are more promising. With a settled labor market the manufacturer feels assured of maximum production, which will act as an incentive to greater expansion. The industrial construction outlook for 1920, promising in plans prepared as in contemplation, therefore largely revolves about the extent to which sound counsel shall prevail between employer and employe.

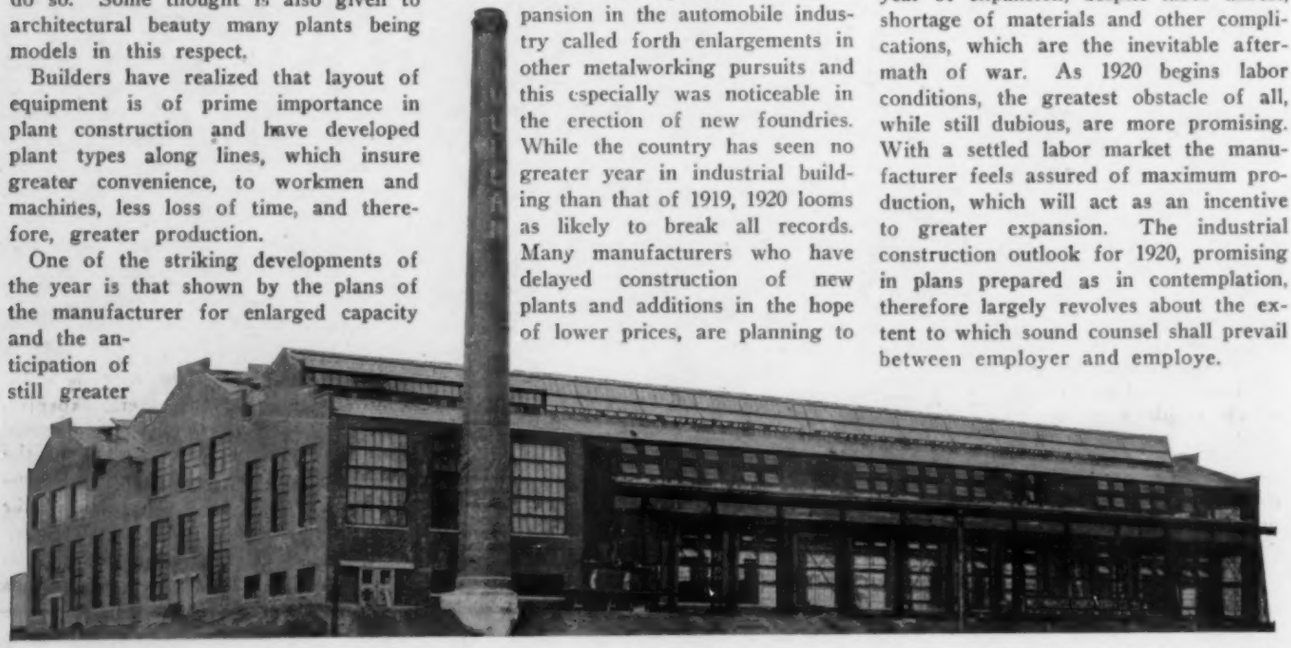


FIG. 12—PLANT OF THE VULCAN PRODUCTS CO. WHICH WAS ERECTED BY WESTINGHOUSE, CHURCH, KERR & CO. IS AN EXAMPLE OF THE BUILDING CONSTRUCTION FOR LARGE FOUNDRIES

THIRTEEN months have elapsed since the signing of the armistice and so far the fear that the machine tool market would be demoralized by the dumping of surplus war equipment, widely expressed a year ago, has not been realized. On the contrary, the demand during the reconstruction period has far surpassed that of wartime; and even now many manufacturers cannot deliver tools in less than two to six, or even eight, months from date of order.

It is not difficult to determine the factors which have contributed the present gratifying condition of the market. The demand for manufactured articles of all kinds greatly exceeds the supply, and machine tools in great number are needed to maintain present production and also to provide additional capacity, which is sorely needed. Just now, however, the future is attracting the thought of the machinery trade. What factors will favorably influence conditions throughout 1920 and what obstacles, if any, must be combatted during the year?

Cannot Keep Up With Demand

An official of the American Machine & Foundry Co., Brooklyn, N. Y., which employs many machine tools, recently said:

"We have no excess producing capacity in any of our departments; on the contrary we would like four times our present capacity and six times our present supply of raw material; also, if it is possible to arrange it, have the day's length extended to 40 hours and have a sufficient supply of well satisfied mechanics to supply us five working shifts. We have hustled since the armistice, but it looks as if we had hustled almost too hard, since we have booked more business than we can fill in the next year."

The Cadillac Motor Car Co., Detroit, reports that during the last few years its "equipment has overcrowded itself to the point where it fairly is bulging out over the sides." For that reason it is erecting a new plant and promises to be a larger consumer of machine tools than ever.

However, there is another side to the situation which is not so bright, and, just as the favorable factors are likely to continue through another year, so are many of the unfavorable ones. Chief among the deterrent influences is labor with its numerous complications. At times during 1919, machinery manufacturers' efforts were considerably curtailed not only by machinists' strikes but by labor troubles in foundries and other shops furnishing them their raw materials, the walkout of steelworkers and the defection of the miners. It is not reasonable to expect that these conditions will be entirely eliminated in 1920, but it is hoped, however, that the situation will be appreciably improved.

Lower Prices Almost Impossible

Restricted production and advancing costs make price reductions a practical impossibility. On the contrary, price advances on machine tools early in the new year are expected in some quarters. During the first months of 1919 many users expected a decided slump and not a few postponed closing. In most cases, however, this delay proved expensive. In a few instances price reductions were made and those who benefited found that the saving in purchase price did not affect the earning power of the machine lost during the waiting period. Later the manufacturers who reduced their prices in order to obtain business, had to make advances. Additional increases were found neces-

Prohibition a Factor In Tool Demand

PROHIBITION is scheduled to bring about an increased demand for machine tools. Because this factor is more or less indirect, it is none the less important. Hotels all over America have taken up the railroad slogan, "See America First," and are doing all in their power to stimulate automobile travel in order to offset the loss in revenue which has resulted and is resulting from the shutting down of the liquor traffic with the consequent closing of hotel bars. It is a known fact that while there are less than 300,000 miles of railway in the United States, the motor car has the use of 3,000,000 miles of highway. According to Motor Age, this mileage is destined to be greatly increased in 1920. It is expected that $633,000,000 will be expended for hard surface highways this year as against $138,000,000 in 1919. With road development carried on in such a comprehensive manner, an increased consumption of automobiles and trucks will result. This in turn will necessitate more productive capacity for automotive factories and it naturally follows that more machine tools will be required.

FIG. 1—EXPANSION AMONG MOTOR TRUCK MANUFACTURERS IS ALMOST CONTINUOUS AND UNUSUAL GROWTH IS ANTICIPATED AMONG THEM FOR 1920. THIS MACHINE SHOP OF CLEVELAND COMPANY HAS MODERN EQUIPMENT

sary so that by the latter part of November, many prices had reached or even exceeded wartime levels.

The railroads, practically out of the machine tool market ever since they went under federal control, are expected to develop a huge demand for machine tools during the next 12 months. It is known that much of the equipment in railroad machine shops is worn out if not altogether obsolete. While many machinery sellers do not expect any sizable orders from railroads until they return to private ownership, the roads fast are reaching the point where they must have new machine tool equipment.

Sporadic purchases by railroads, of course, have been made during 1919, but these have not kept pace with increasing needs. Inquiries have been numerous in recent months from various roads, including Pennsylvania lines west, New York Central lines, and the Chicago, Burlington & Quincy Rock Island and Santa Fe railroads. Sizable bookings are expected from these and others more before many months have passed.

By way of contrast, shipbuilders are not expected to display much interest in machine tool offerings; in fact, some attractive offerings of used machinery are expected to be made by them. During the war the shipyards of the country acquired considerable machinery and already some are disposing of a portion of their equipment. Some tools for replacement may be required but it is thought that the demand for this purpose will be nominal.

Considerable business during the past year has come to machine tool sellers from the industries which during the war were termed "nonessentials" for want of a better name. Manufacturers of coffee-making machinery, typewriters, cream separators, adding machines, vacuum cleaners, etc., made efforts to get on their feet again. Munitions makers devoted most of the year to the task of changing back to their normal product. This, in many cases, involved the disposal of war work equipment and the installation of new machines, a process often delayed by the unwinding of governmental red tape in settling war contracts. Since some of these only now are being negotiated, it may be said that only a good start has been made by the "nonessential" industries in getting back to prewar conditions. Apparently this constitutes a large field for used machinery dealers, and that they are alive to the opportunities is evidenced by the large number of inquiries received in response to stock lists sent out.

More Food Means More Tools

Increasing demands for food both for domestic and foreign consumption mean much to machine tool manufacturers. The tractor industry, now in its infancy, is growing by leaps and bounds in response to the call for more activity in agricultural pursuits, and this means a large market for machinery. Tractor manufacturers have taken much equipment during the past year but preparations are being made to satisfy a huge demand during 1920. It is stated that at present there are 2500 farm tractors in use in the state of Pennsylvania alone and that this number will be greatly increased during 1920. A survey of the tractor field made in 1918, shows there were 3,355,895,722 acres of land under cultivation in the United States. Dividing this by 80, the average acreage of farms, it is seen that there are 41,948,696 potential farms in the United States. Tractors no longer are in experimental stage, and it has been assumed that there will be a demand for approximately 7,000,000 tractors at an early date.

Tremendous expansion in tractor production is planned by the General Motors Corp., Detroit, and Henry Ford & Son, Dearborn, Mich. The former's Samson tractor plant at Janesville, Wis., which was a large buyer of tools in Chicago, Detroit and elsewhere, had arrived at an average daily production of 60 tractors by the beginning of December. Quantity production is expected to start early in 1920 at Ford's Hamilton, O., tractor plant, for which a large quantity of tools had to be purchased.

Provision for expansion at the two plants mentioned was made in advance, since more room was a presupposed necessity. This is true of others, all of which have taken their quota of machine tool equipment in the past year. Included in this number are the Holt Mfg. Co., Peoria, Ill.; the Hart-Parr Co., Charles City, Iowa; the Hollis Tractor Co., Tiffin, O.; the Shelby Tractor & Truck Co., Shelby, O.; the Cleveland Tractor Co., Post Tractor Co., and J. T. Tractor Co., Cleveland; the International Harvester Co., Chicago; the Moline Plow Co., East Moline, Ill.; and many others, all of whom are said to have huge numbers of unfilled orders on their books.

Perhaps no branch of industry negotiated the transitory period from

war to peace with less friction than the motor truck group. This was true because no radical change in output was necessary. Motor truck manufacturers had been producing at 100 per cent capacity for the government and they simply diverted their product to peacetime channels. However, the motor truck industry will figure in machine tool market in 1920. Ohio, New York and Michigan are the three greatest truck producing states and Ohio is said to have more trucks in operation than any other state. Reports indicate that farmers are being educated to the advantages of using trucks. Shipping by truck instead of by freight train steadily is gaining in popularity. For these and other reasons truck manufacturers are finding it necessary to expand continually.

One large buyer of machine tools in Cleveland during 1919 was the White Motor Co. For many weeks its daily production has averaged 50 trucks. It constantly is adding buildings to its already huge plant and in November new machinery was arriving at the plant almost daily. A section of the well-lighted, broad-aisled machine shop is shown in Fig. 1, and Fig. 2 shows a portion of its gear generating department.

While the increase of the motor truck business in 1919 was enormous, greater things are promised for 1920. A little over a year ago, the business was over 75 per cent below normal, while now it is more than 75 per cent in advance of the best months known. This increase partially was contributed by sales abroad, chiefly South America. Truck builders are preparing to give an increased measure of attention to the export trade this year. In some quarters the supplanting of street cars by trucks is anticipated.

Automobiles Take 70 Per Cent

Passenger automobile manufacturers, however, represent the largest users of the majority of machine tools today. A low percentage of planers and boring mills is sold for this branch of industry but the percentage of crankshaft and heavy-duty lathes, milling machines, multiple spindle and heavy-duty drills, automatics, gear generators, etc., is large. The average percentage of sales to the automotive trade by eight representative machinery dealers is about 70 per cent, 95 per cent being the maximum and 50 the minimum. The demand for tools by automobile builders has been particularly heavy since the signing of the armistice and doubtless will be increased this year.

Evidence to substantiate this is found in the building program of the automotive and allied industries in various parts of the country. In Detroit alone, of the total of about $100,000,000 in building construction now started or contemplated, over half originated with the automotive or allied industries, as shown by the following list:

General Motors Corp.	$12,650,000
Maxwell-Chalmers Motor Car Co.	12,000,000
Fisher Body Corp.	10,000,000
Studebaker Corp.	10,000,000
Paige-Detroit Motor Car Co.	5,000,000
Detroit Seamless Steel Tubes Co.	3,000,000
Hudson Motor Car Co.	2,250,000
Morgan-Wright Tire Co.	1,000,000
Goodyear Tire & Rubber Co.	1,000,000
Packard Motor Car Co.	1,750,000
Wadsworth Mfg. Co.	1,000,000
Total	$59,650,000

This does not include the $40,000,000 blast furnace project of the Ford Motor Co., at River Rouge, Mich.; the Wills-Lee automobile plant at Marysville, Mich.; and the industrial activity at Flint, Pontiac, Bay City and other Michigan towns.

As estimated by the president of a prominent Cleveland automobile company, the automobile industry of the country is 1,000,000 cars short of filling the present demand. He recently said: "One motor vehicle now is in use for every 19 persons in the United States and this ratio doubtless will be greatly decreased before another year rolls by." Statisticians look for 20,000,000 users of automobiles and trucks by 1922 or 1924.

That the demands from the automotive field have exerted a powerful influence on machine tool design is universally conceded, both by dealers and manufacturers. One well known machine dealer states: "Ever since the advent of the automobile, the machine tool industry has been striving to meet its requirements. Practically every tool designed within the last 15 years has been influenced in some manner by prevailing practice of automobile production work." In many cases this demand has made for increased weight and strength. In others, reduction of space requirements without a corresponding lowering of production capacity is the factor.

Production capacity is the great need of automobile manufacturers. Those in the Detroit territory are particularly noted for their willingness to throw out machinery and make room for tools which will increase their output even if the percentage of increase is relatively low.

Reports from 16 representative ma-

FIG. 2—THE AUTOMOTIVE TRADE TAKES ADVANTAGE OF ALL TYPES OF LABOR-SAVING EQUIPMENT BROUGHT OUT. IN THIS GEAR-GENERATING PLANT ONE OPERATOR TAKES CARE OF A BATTERY OF SIX GEAR CUTTERS

chine tool manufacturers indicate 60 per cent as the average of their output going to the automotive trade. The percentages as given run all the way from 35 to 80 per cent. Machine tool manufacturers generally, except those whose product is absorbed by other lines, state that while the requirements of the automotive industry wield a powerful influence upon machine tool design, it does not exert absolute control. One eastern manufacturer, however, goes so far as to state that the automotive demand absolutely governs machine tool design today.

New Milling Machine Produced

Many machine tools have been brought out in recent years, primarily for the automotive trade in answer to its call for increased production. An interesting departure from established precedent was accomplished early in 1919 by the Oesterlein Machine Co., Cincinnati, with its tilted rotary milling machine, illustrated and described on page 1359 of the May 22 issue of THE IRON TRADE REVIEW. Another special type of milling machine, brought out by the Ingersoll Milling Machine Co., Rockford, Ill., for Henry Ford & Son, Dearborn, Mich., in June last year, is the continuous rotary for milling the ends of tractor cylinders.

Like activity on the part of automobile, truck, tractor and trailer manufacturers means an ever-increasing tire consumption, and in turn, tire manufacturers are becoming increasingly important as machine tool users. There is a growing inclination on the part of tire makers to maintain their own machine shops. Akron, O., which has become the center of tire making, likewise has become a large machine tool consuming center. In the fiscal year ended Dec. 1, 1919, the Goodyear Tire & Rubber Co., that city, reported gross sales of $168,914,982, the largest in the company's history and $37,677,600 more than the preceding year's sales. Other tire companies show similar favorable records. The Goodyear company, in common with other Akron and Cleveland tire companies, including the B. F. Goodrich Co., and the Firestone Tire & Rubber Co., of the former city, issued large lists of machine tool requirements during the latter part of 1919. Closing on some of these was postponed and is scheduled to take place early this year.

Automobile parts companies all have shared in the prosperity which descended upon the automobile industry with the close of the war. These were important buyers in 1919 and unless all signs fail, will continue to take their quota of the product of machine tool manufacturers during the coming year.

The demands made upon machine tool builders in recent years have included the following:

1. More substantial and larger machinery; more power and greater speed.
2. Greater accuracy, better workmanship and increased productive capacity.
3. Elimination of many sizes; specialization; concentration on single purpose tools.
4. Simplified construction; more automatic features; simplified mechanisms; fool-proof design.
5. Improved lubrication systems; self-oiling machinery.

Exceptions to the first are noted. In some cases there has been a refinement of design, adapting lighter machines to heavier work. However, reputable machinery sellers always encourage users to purchase equipment heavier than that called for by the work in hand. Many builders now are putting the heavy parts where they are most needed. Instead of making the base and legs heavier, the weight of the bearings is increased and working surfaces are wider, giving greater range. In the Detroit district, large batteries of drilling machines and other motor shop equipment are about to be scrapped due to the fact that they are too light for the work in hand. The single-purpose tools purchased recently by the General Motors Corp. are much heavier than tools used formerly. In fact the tendency seems present everywhere toward heavier machinery. Possible exceptions are where specialization is opening up the field for small machines and where small parts are being manufactured.

FIG. 3—TILTED ROTARY MILLING MACHINE DEVELOPED LAST YEAR, IS DEPARTURE FROM CONVENTIONAL DESIGN

War Taught Lessons

Manufacturers are profiting by lessons learned during the war. In one instance where 3-inch shells were finished on 18-inch lathes, it later was found that 24-inch or heavier, single-purpose lathes were better adapted to the work. Absorption of vibration and rigidity under stress are being given closer attention than formerly. Coupled with this fact is the growing intelligent use of modern alloy steels properly heat treated to secure lightness and strength which aid in reducing inertia in rapidly moving parts.

Demand for the multiple purpose and single operation tools seems evenly divided. This comes about because of the difference of opinion on the part of production managers. Those of one group specify the tool which performs but one operation, while others call for the machine which performs every possible operation at one chucking. Generally speaking, the determining factor in machine tool purchase as to whether or not single-purpose tools are desirable is quantity production. The company producing 10,000 pieces a day purchases the single purpose, highly specialized tool for the work, whereas a plant whose output perhaps is 200 pieces per day is compelled for economic reasons to buy the machine which would perform many operations. Since the cutting time cannot be appreciably lowered, an increasing measure of attention is being paid to the handling time for machine work. To this end much special machinery is being produced. One striking example of this is the gear-cutting machine shown in Fig. 4, furnished

to a Toledo, O., automobile manufacturer by Gould & Eberhardt, Newark, N. J. It has a special sub-base, a gravity oiling system and is arranged with fixed turret head for roughing out four-spur pinions at one time while four blanks may be unloaded and new blanks reloaded. On a small pinion job, the setting up time takes longer than the actual cutting time and this time is saved in being able to rotate four work spindles while the other set is in cutting operation.

Automatic Machines Used

To reduce the handling time, not only are machines being made more nearly automatic, but machinery manufacturers encourage the purchase of the best chucking devices possible and the use of duplicate sets of fixtures. The duplicate set is loaded while operations are going on and then are indexed into position. The use of special fixtures, air-operated, magnetic and other quick acting chucks has helped considerably as has the utilization of electric shop trucks, conveyors and other improved methods of efficient handling of materials in the shops. Considerable study also has been given to the elimination of unnecessary movements on the part of the operator by placing everything within easy reach, thus, in some machines all handles and levers are brought to the front. Operators are being trained along this line. More careful attention likewise is being paid to the manner in rigging up machines for the work. One important factor in the reduction of the handling time is direct electric motor drive. Evidence is furnished by machine tool builders and dealers that users fast are becoming educated to the desirability of this feature and while the average demand at present is about 35 per cent it steadily is on the increase. Some manufacturers report that the demand for direct electric drive runs as high as 80 per cent where electric power rates are low. Greater demand for direct drive machine tools has been brought about by the increasing use of saw-tooth type and the 1-story steel skeleton frame buildings. These types have no ceiling to which line shafting and countershafting can be attached. They have I-beams to which stringers are fastened, but to mount overhead mechanisms on them would defeat the purpose of the saw-tooth type of building. Consequently individual motors are more desirable in such plants.

While there is no marked tendency to supplant horizontal machines with vertical to save space, the latter type is being used in many quarters because of increased efficiency, greater adaptability and productive capacity, dependent of course upon the class of work. Manufacturers of vertical milling machines report an increased demand for that type, as do builders of heavy duty drilling machines, which might be called vertical boring machines. It is reported that vertical boring rapidly is coming into favor, replacing horizontal boring.

An interesting experience is recorded by the Industrial Works, Bay City, Mich. It manufactures a great many heavy steel gear blanks and rollers in diameters from 12 to 48 inches. By the use of a vertical boring mill instead of a lathe, the operating time for turning, boring and facing operations has been reduced from 30 to 50 per cent. It cites a saving in chucking time; use of heavier feeds and speeds; and the possibility for closer coupling between face plate and driving motor. It is claimed that vertical machines are unusually rigid, and tools are fed vertically with gravity acting along the same lines as the tool movement. Chips and borings are self-clearing with the vertical tools. This company states that because of these many advantages, it will replace horizontal machines on this class of work, with vertical tools as soon as required.

FIG. 4—VERTICAL MACHINE WITH FIXED TURRET HEAD ROUGH CUTS FOUR GEARS AT ONE TIME

Uses Vertical Type for War Work

During the war the Wisconsin Gun Co., Milwaukee, discovered that a number of operations were better suited to vertical boring mills or in reality vertical turret lathes than to horizontal machines. For instance, at first the breech block of the French 75-millimeter field gun was turned on an ordinary lathe where the time required to finish the job was nine hours. After transferring the work to a 24-inch vertical turret lathe, manufactured by the Bullard Machine Tool Co., Bridgeport, Conn., which essentially is a vertical boring mill, the time was reduced one-third, because on it no time is lost between cuts. It is easier to lay work down on the table than it is to hang it up in a chuck. This machine is shown in Fig. 5.

In view of the many different vertical tools extant today, it is interesting to think of the slotter or vertical planer as the "daddy" of them all. Improvements have been made from time to time and one of the latest to be brought out was placed on the market early last year by the Newton Machine Tool Works, Inc., Philadelphia. It was described on page 208 of the Jan. 16 issue of THE IRON TRADE REVIEW and is shown herewith in Fig. 6.

Since machine shops as well as production shops usually have plenty of room upward, many manufacturers are paying more attention to the vertical types of tools than formerly. They are specifying them wherever applicable but rarely sacrifice productive capacity for less floor space. They find that the earning power of the machines makes up for the cost of new buildings in numerous instances and this doubtless explains the large

building programs in progress or contemplated in various sections of the country. One prominent machine tool dealer in the Middle West discusses this subject as follows: "The problem of space conservation is superseded by the problem of obtaining production. No manufacturer would buy a machine tool because the floor space dimensions were one foot shorter and one foot narrower even if the machine was capable of producing within 90 per cent of the larger machine occupying a space a foot longer or a foot wider. Instances are numerous in our knowledge where a rearrangement of machine tools, involving additional floor space by giving greater facilities for handling material, which have resulted in a considerable increase in production and this is what manufacturers are seeking." Another way to utilize head room is by the use of tiering machinery.

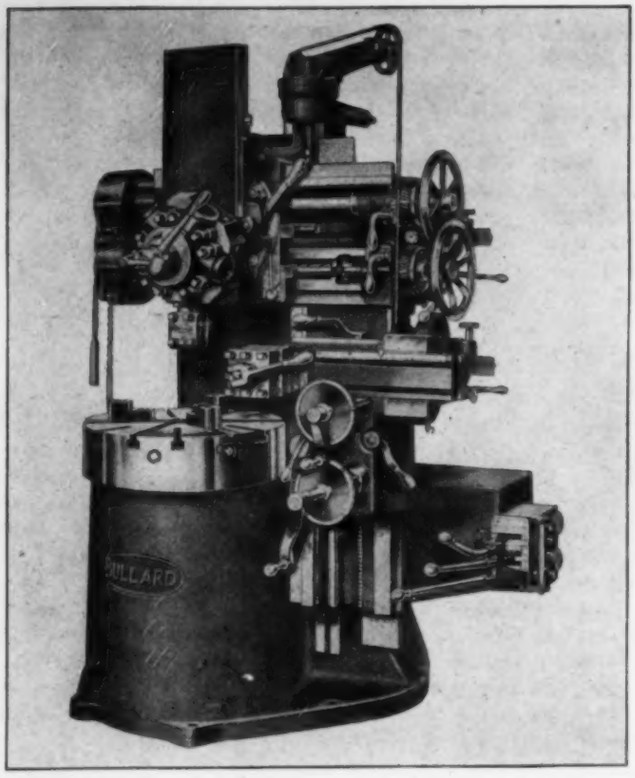


FIG. 5—VERTICAL TURRET LATHES ARE PREFERRED FOR A CERTAIN WORK

Preference for the vertical types of tools is noted on the part of the General Motors Corp. and the Ford Motor Co., Detroit. The Buick Motor Co. division of the former corporation at Flint, Mich., prefers the vertical provided the multiplication of work by it is equal to or exceeds that of the horizontal type. A few of the horizontal machines have been supplanted by verticals. For several years it has been the policy of the Ford company, it states, to install multiple spindle vertical type machines wherever possible in preference to the horizontal machines for purposes of space economy.

In the plant of the Bucyrus Co., South Milwaukee, Wis., many changes in equipment are being made. These are along the line of adopting higher powered lathes, planers, drill presses, etc., than those used formerly. By this means the company hopes to obtain full value out of the best high speed steels. This company now is machining part of its work on heavy-duty milling machines rather than planers. For purposes of economy, it also is adopting more fully the plan of roughing such parts as heavy drum shafts, etc., on lathes and finishing them on grinders.

Spreading labor unrest, so prevalent during the past year, has had its effect upon machine tool design, demand and sale. Many users and manufacturers of machinery are throwing out old tools and installing labor-saving equipment and machinery which does not require the services of skilled operators. The supply of all around machinists is short and rapidly is growing less and now we have lathe hands, planer hands, milling machine hands, etc. With the remuneration of labor increased threefold, means must be found to increase labor's productive effort; hence the tendency to specify more automatic machinery, machine tools which can be ganged, etc. One case in point is in the manufacture of gears; one man takes care of six gear generators.

Notes Tendency Toward Automatics

As alluded to above, many manufacturers show a greater tendency to specify tools on which many operations can be performed at one time. The Jones & Lamson Machine Co., Springfield, Vt., notes a specific drift toward automatic machinery even when larger output can be obtained on a hand machine. This, it is stated, is due to the ability to utilize unskilled labor on the automatics. The Garvin Machine Co., New York, notes a demand for special machinery, although it is concentrating on its catalog types because of the existing heavy demand. It cites the case of one manufacturer who formerly slotted the armature of a small motor on a milling machine and who now accomplishes this work on an automatic machine. This is only one instance of many which, it states, have come about by the labor unrest and the manufacturer's anxiety to use the least possible number of operators and at the same time increase his production. Users are calling for more rapid traverse on planers, milling machines, etc. In the case of drilling machinery, more study is given to the subject of manipulating work under the drill spindle. This means that the best of jigs and fixtures must be employed to insure the speediest locating of the point which is to be drilled and the return of the twist drill to its normal position for a change in tools as for a reamer or tap. Extended reference was made in an article entitled "From Engines of War to Instruments of Peace," published in THE IRON TRADE REVIEW of Oct. 9, war equipment but no discussion of the machine tool situation is complete without considering war equipment.

Although expected for many years, it was not until recent weeks that the sale of government-owned equipment has been found to actually militate against the sale of new equipment in this country. Prior to that time, large bills of machines were sold abroad, particularly to Belgium and France, these countries taking many millions of dollars worth. On Sept. 5, it sold over 2500 machine tools to Belgian manufacturers, whose government had established credit for them through American financiers. On Dec. 15 a contract was ratified with France for $25,000,000 worth of tools from surplus war department stocks. In November, the government had indicated that while not entirely discontinuing its practice of selling the machinery abroad, it would also dispose of it to the domestic trade. Lists accordingly have been issued from time to time recently, one dated Nov. 12, listed 2500 tools, worth $4,000,000.

Simultaneous with the issuance of this list, it was developed that the government's effort to dispose of its tools quickly in harmony with the plan as published in full with charts for determining service value in the June 12 and Aug. 7 issues of THE IRON TRADE REVIEW, had been set aside. The

plan as at present constituted is to sell the equipment at as large a profit as is possible to obtain. This is having a retarding effect on the enthusiasm of dealers in regard to this machinery and they believe that it will be less of a governing factor in the 1920 market than it was in 1919. From several sections, indications are received that some manufacturers who bought second hand war equipment during 1919 intend to replace it with new machinery as soon as the delivery situation becomes somewhat improved. Purchasers, however, will continue to be found for the equipment which still is appearing from former war plants. One of the latest sales reported was held at the rifle plant at Eddystone, Pa., in December, when approximately 700 tools were sold to the highest bidders. It is reported that in Michigan the effects of such sales have been felt more than in other districts. One prominent dealer in Detroit states that every time Michigan dealers sell $10,000 worth of equipment, the government sells $20,000 worth. "In spite of this," he states, "trade is excellent."

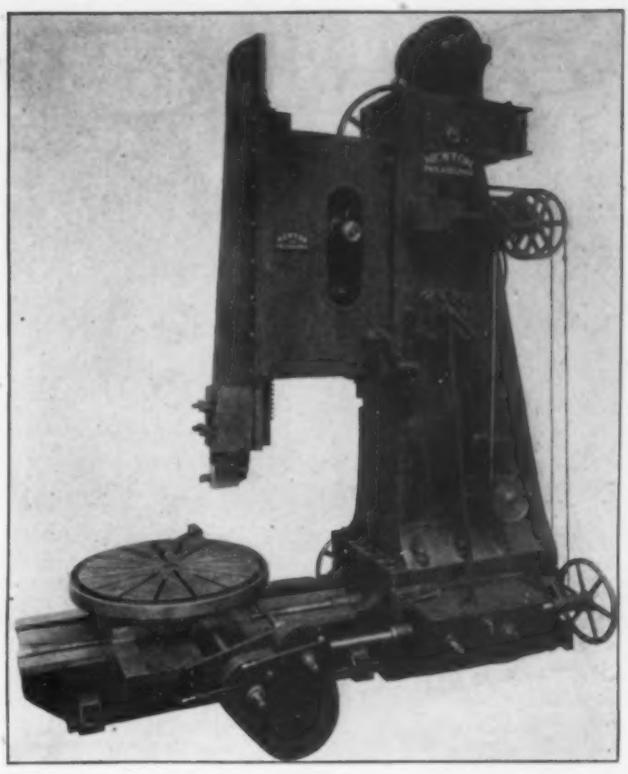


FIG. 6—SLOTTER OR UPRIGHT PLANER LED WAY FOR VERTICAL MACHINES

In this connection, little information seems available as to the amount of war equipment found useless and scrapped during the past year. The Westinghouse Electric & Mfg. Co. disposed of standard machines made idle by the armistice and demolished those which were useless, selling them for scrap. The Taft Pierce Mfg. Co., Woonsocket, R. I., had a contract during the early part of the war for 21-second time fuses for Russia, and after its contract was finished, it scrapped about 20 special machines. Much of the special machinery in munition plants throughout the country has found its way to the scrap heap and other machines are "just one jump from it," to quote a prominent machinery dealer. One Detroit dealer estimates that in Michigan alone there remains at least $2,000,000 worth of tools, which for economic reasons should be scrapped at once.

While the United States government always has been and always will be a heavy user of machine tools, it is thought that it is practically out of the market for some time to come. Its arsenals, navy yards, etc., became so well equipped during war time that any additional machinery they require will be furnished from government-owned stocks, some of which are being held for such contingencies.

Naturally, those machinery manufacturers who dispose of large quantities of machinery abroad have noticed the effect of government sales in foreign countries more than others. They have been handicapped in the matter of granting credit, the government's ability to arrange for long time credits having made it impossible for them to consummate many sales.

Exporters Encounter Obstacles

Other deterrents upon the sale of American-made machinery abroad include the longshoremen's strike in the East and the low exchange rates which have made American prices from 35 to 40 per cent higher than machines made in Germany.

In this connection it is interesting to note the descending scale for exports of machinery from the high point reached in June, when the machinery exports totaled $8,606,565; July's total was $4,440,819; in August they totaled $3,849,143; September with $3,871,502, registered a slight increase. October noted a partial recovery with $5,079,586, which exceeded July's by $638,767; these data being furnished by the United States department of commerce.

Prospects for the sale of American-built machinery abroad in 1920 are fair, according to the sellers. An improvement in the exchange rate is hailed as the exporter's best relief. Some representatives of France, Italy and Belgium have visited this country as members of commissions in recent months and have indicated their preference for American machinery over that offered by Germany at greatly reduced prices. Foreign users of machinery have become educated to the superiority of equipment built in America and machine tool builders realize there always will be a large market abroad for their product. Several have established foreign agencies during the past year, and a few are issuing catalogs printed in French and Spanish. Quite a number of machinery exporting firms have been organized and these are preparing for increased effort in the coming months. The statement of the Newton Machine Tool Works, Philadelphia, has no uncertain ring:

"The possibilities for the sale of first quality American-made machine tools abroad are brilliant if American manufacturers will consolidate under the Webb-Clayton act and handle foreign sales and credits with the same degree of energy and intelligence expended upon domestic sales. This will include not only a sales department but an engineering and service department as well, operating from central headquarters for continental Europe."

To summarize, first and foremost in the domestic market is the automotive and allied industries; these are said to be taking part in or facing a period of expansion perhaps never before enjoyed. Also looming up as a powerful factor in trade for equipment sellers, is railroad buying. General machine shops possibly are next in line, including those of oil well companies, which will require much pipe machinery. General manufacturing in all parts of the country is enjoying and is scheduled to enjoy a demand which resembles and in some cases betters the wartime trade. Foreign trade seems to hinge upon exchange improvement and stabilized credits.

The favorable factors having a bearing upon the machine tool market in 1920 seem to far outweigh the unfavorable ones and barring unforeseen contingencies, the outlook for machine tool business at home and abroad is more than encouraging.

From Pittsburgh to Palestine

American Iron and Steel Products Now Appearing in All the Markets of the World—Past Year Marks a Significant Era in the Export Trade—Outlook is Brighter

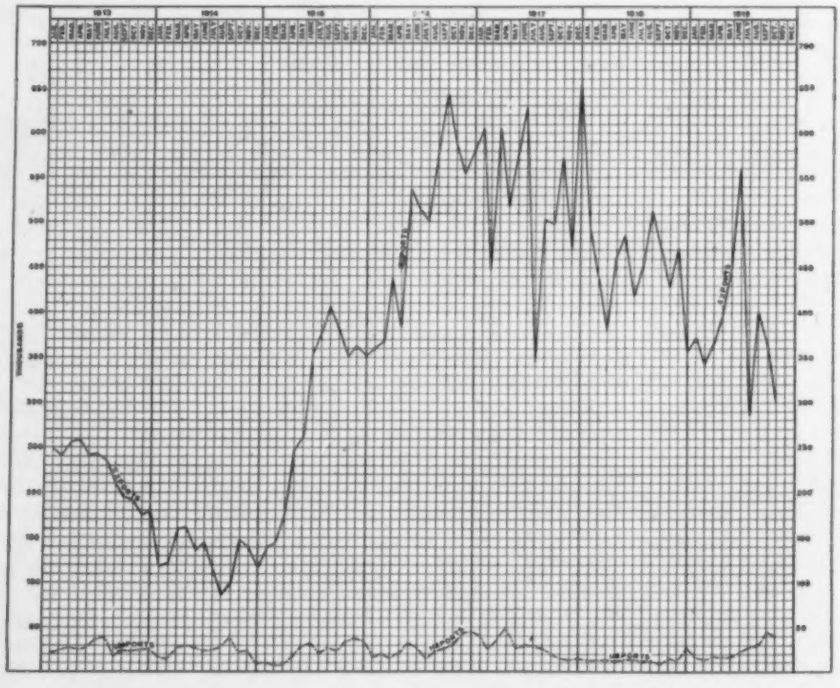
BY V. G. IDEN

DURING the first eight months of 1919 the United States exported as much iron and steel as was supplied to foreign countries during the twelve months of 1915. When the final statistics of the year are compiled the outbound shipments probably will be three times the tonnage exported during 1914. If 1919 is to be considered a peacetime year the amount of money involved in this trade will constitute a record. But the American iron and steel industry has little reason to pat itself on the back over this record. The foreign orders that have come to the United States have gravitated here by natural law; they have been practically forced upon American producers. On the other hand the industry never before has had the services of so many well-organized or serious-minded exporters who are in the business to stay and are making a thorough study of it accordingly. The year has been marked with considerable struggle, many mistakes and a great awakening to the possibilities of foreign markets.

While 1920 opens with European competition looming more positively, the prospects for American overseas business are even brighter than they were a year ago. Today the iron and steel industry of this country has at its beck and call the services of various new but capable export executives and organizations who have mastered some of the fundamentals and still are learning the intricacies of the trade. Given proper support and encouragement these agencies undoubtedly will be able to place the American product in all the markets of the world. By a study of the history of the past only can the problems of the present day be understood. The past year has been complicted by after-the-war effects. Political uncertainties with various nations, industrial unrest, the shipping shortage and credit needs throughout the world are but few of the problems which iron and steel exporters have been compelled to face. The year 1920 will see the elimination of some of these harassing influences. Having gone through them, exporters have profited much though at a considerable expense out of pocket. If character is the result of surmounting difficulties, then the year 1919 will be memorable for having given that quality to the American export trade.

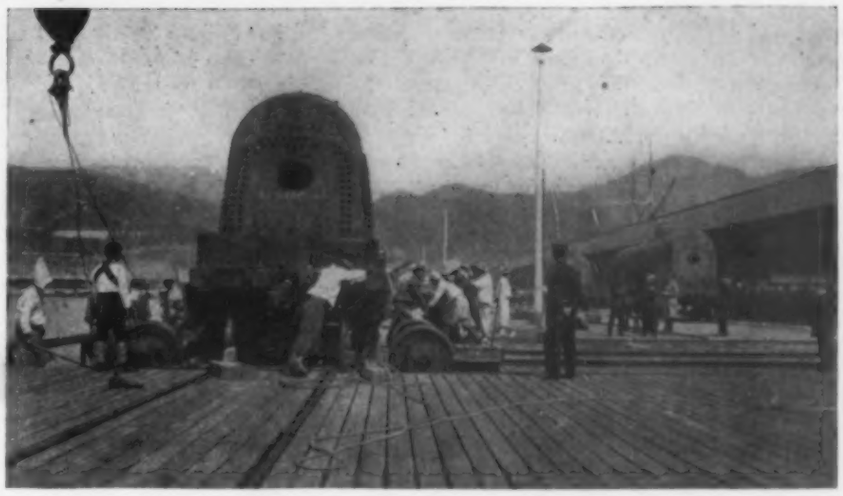
Discrepancy in exchange has been no little drawback to exports and this situation instead of becoming relieved during the past year appears to have increased in gravity. The result today is that there are few countries of any importance in which the American dollar is not selling at a premium. It is obvious that this enhances the selling price of American goods abroad. The American mill expects to obtain its pay in dollars as that is the only medium of exchange it can use. If a Frenchman is compelled to pay out twice as many francs for a dollar as he normally should pay, the effect is that he is paying a double price for the American goods. The German has been compelled at times to pay ten times as many marks for an American dollar as ordinarily. The cost of a dollar to an Austrian is even greater than to a German. The dollar has cost the Italian more than twice as much as it did before the war, thereby making it a greater hardship for him to purchase American goods than for a Frenchman.

The fluctuation in the exchange on Belgium, however, should give a true indication of what ultimately will remove this discrepancy. The Belgium exchange has not been as low as the French. Yet Belgium suffered as much devastation as France during the war, borrowed as much money proportionately and imported in great volume. Since the signing of the armistice Belgium has made rapid strides in restoring her industries. Beginning with the middle of the summer of 1919, the world began to realize that Belgium would have products to export and immediately there was greater confidence. It has been this same tendency which has saved England. Sterling has been reaching rather low levels, not so low as the franc or the lire, but since the former for years has been the international medium of exchange, a slight reduction has a much more serious effect. England has been producing during the past year and her ability to continue producing is the one thing that has checked the reduction in the value of her



MONTHLY IMPORTS AND EXPORTS OF AMERICAN IRON AND STEEL 1913–1919

money. The exchange situation as it affects Europe gives greater encouragement to citizens of the United States to import from those sources, whereas it would be more profitable to export to South America. And so it has been more profitable to export to the Orient. In the Far East the exchange discrepancy against American goods has been felt only in India and Australia. Those being British possessions, their medium of exchange is the pound sterling and they have been affected equally with the mother country.



JAPAN IS BUYING AMERICAN RAILWAY MATERIALS FOR MANCHURIA

No proper understanding of the export situation would be complete without a thorough canvass of the exchange situation. This has been one of the most harassing problems that the American iron and steel producer has been forced to contend with in foreign markets. So long as the United States government was extending credits and more credits out of the general treasury, the exchange was artificially maintained. But these credits expired last summer. They were completely exhausted by fall. Even prior to this exhaustion of governmental credits, the exchange quotations began to anticipate the results. From that time on the values of the currencies of the world began to undergo great changes. There have been temporary checks and fluctuating quotations with the tendency downward.

Criticism Wrongly Placed

Practical iron and steel makers have been inclined to criticise Wall street for this situation without attempting to analyze the matter thoroughly. Wall street is a great reservoir of money but it has been impossible for the American bankers, acting independently, to do anything. A few hundred million dollars could be thrown into the breach without the least effect. Some groups of bankers have gone ahead and made loans of this size to some of the foreign nations and still the rate of exchange has continued to go down. Some of the most practical experts in the export field are confident that no remedy artificially devised will be adequate, and that the only cure is to be found in placing the countries of Europe upon a production basis again.

An influential group of railway equipment men have attempted one of the artificial checks on depreciated exchange by creating a giant international financing corporation. It is proposed that this corporation shall accept foreign securities in return for goods sold. With these securities as a basis, the corporation would issue debentures for sale in the American money market. The plan is sound but it requires some time to be worked out. It has been in the hands of the lawyers and when put into practice will undoubtedly assist considerably the railway material manufacturers in the foreign field. No matter how good the plan is, however, it will not permanently correct the present trouble. Its greatest results will be realized during normal times as it will be a means of finding markets abroad.

Out of the welter of troubles of the past year should come important developments, such developments as will be of great benefit to American trade in the future. The export financing corporation is the one thing now in sight which is most imminent in this direction. Considerable talk has also been heard about making investments abroad in a direct way. This is a supplementary relief. According to recent dispatches from abroad powerful American steel interests have had in mind investing in the steel plants of Luxemburg. Such a move, however, would be but a co-ordination of interests in two of the greatest producing fields of the world and its benefit to American exporting mills would be but indirect.

Combinations of American producers to engage in the export trade were legalized a little over a year ago. Congress consented to this move because it was wished to create instruments in international trade that would be capable of competing with the great combinations in other countries, notably Germany. The Consolidated Steel Corp. was one of the first formed. The Consolidated corporation was a little late in getting into operation last year, although its sales abroad have run into large tonnage. On the other hand it is a question whether the mills in that group have sold larger tonnages proportionately in foreign markets than have producers not included. The foreign requirements have been so great and insistent that the opportunities for sale have been unprecedented.

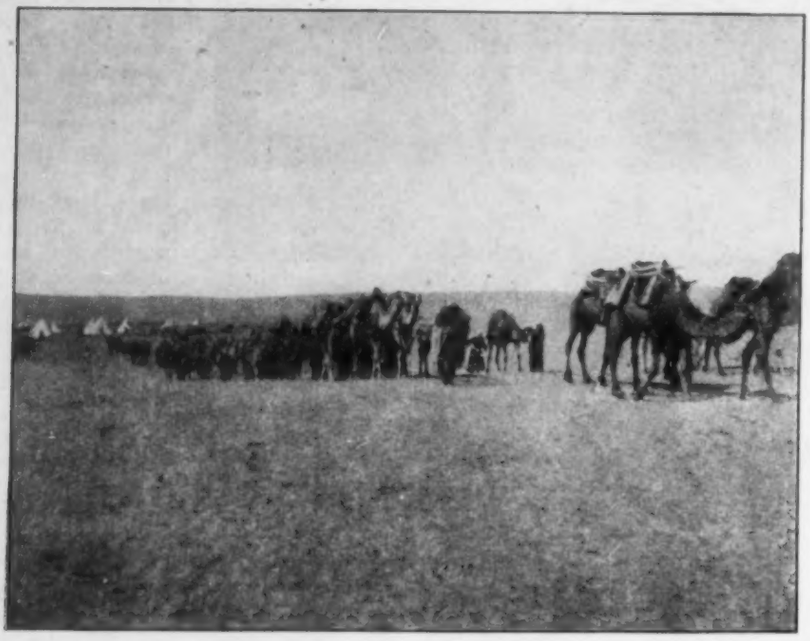
When the armistice was signed American mills had many "sleeping" contracts on their books. These were contracts made before the government imposed an embargo during the war to conserve supplies. Generally they had been taken at a price much higher than has since prevailed. Individual purchasers abroad were naturally unwilling to accept material on those old contracts and consequently a siege of concellations set in. The mills in a few instances made it difficult to the buyers and costly settlements were demanded. This was not general, however, as the producers with a broader vision agreed to a substitution of contracts and the sales soon were restored upon a new basis.

Export Sales Start to Grow

For a time the tendency was toward a lower price. Some buyers held off. Essential needs in the meantime had to be filled and these orders began coming in gradually until a reflex movement was recognized. The volume of export sales began piling up. During the summer months, June, July and August, the foreign orders reached their maximum. At that time it was estimated that overseas buyers were taking American iron and steel at the rate of approximately 400,000 tons a month. Then a series of disturbances began. First the seamen struck, then the longshoremen. These labor outbreaks were followed by the steel strike and ultimately the strike of the coal miners. During the last quarter of 1919 mill production was far below normal and it was increasingly difficult to place foreign orders in this country because the material was not available. Orders booked for delivery during the

last quarter had to be carried to 1920.

In the meantime there was no purchasing for foreign account for future delivery. That represents the crucial point in the history of the market during the past year. Despite the great volume of orders booked, these largely called for immediate delivery. Sales made accordingly have indicated no great permanency to the trade. There has been lacking that stability which has been so characteristic of normal German and English foreign trade.



TRANSPORTING AMERICAN PIPE IN PALESTINE

Costs of production in Europe have been high and the quantity produced much below normal. It has been necessarily so. American sales abroad have been the direct result of cheaper prices and quicker deliveries. The continent of Europe, very naturally, had nothing to export and what little has been produced there during the past year has been needed at home for rehabilitation purposes. England has had just as great needs, and British labor conditions have been abnormal. Despite this England has exported iron and steel during the past year and is now rapidly reorganizing and restoring her foreign trade operations. So keen has England been to retain her export trade that her agents have been buying heavily in the American market for customers abroad.

The English steel competition can be measured only relatively. During 1919 the United States exported probably more than twice as much iron and steel as did England, yet it is patent that the latter has started to recover in the export trade and her improvement during the past year has shown a greater relative progress than has the United States. During the first eight months of 1919 the United States exported an average of 393,000 tons of iron and steel a month, whereas England exported an average of only 178,000 tons per month. But during the first six months of 1919 the United States had exported approximately 2,340,000 tons or less than one-half the amount exported during 1918 when the war embargo was on. On the other hand, England had exported during the first six months of 1919 two-thirds of the amount she exported during the whole of the year of 1918. England's exports for 1919 will far exceed her total exports during 1918, while the exports of American producers will be less than during the previous year.

These statistics, although incomplete at this time, indicate clearly that the English producers have been able to recover quickly and their foreign trade has made far greater progress during the past year than has been the case with the United States. The depreciation in sterling exchange normally would be a factor to encourage English exports. It must not be forgotten, however, that during 1919 the English prices have been higher than those concurrently prevailing in the United States, even when the rate of exchange was taken into consideration. England has been able to export despite these obstacles because she has had the export trade experience, the executives and the business organization to promote it.

It is evident that the United States has not seized all the opportunities offered. As a matter of fact many American iron and steel men have been spending their time chasing about Europe, trying to pocket the attractive iron and steel orders they anticipatd those countries would give. It has been like chasing a rainbow, for Europe has little business in this line she intends to give to this country. Europe's needs for rehabilitation are tremendous but most of these needs will be filled at home, and what cannot be supplied on the continent will be placed in England L. Luiggi, member of the Italian mission recently visiting the United States, said very frankly that Italy's needs consist chiefly of agricultural machinery, house-building machinery and machines for the fishing industries. He estimated the metal needs of Italy as totaling 605,000 tons annually for the next five years, this total being made up of ingots and semi-finished steel, pig iron, plates and shapes, steel rails, scrap iron, tin plates, copper and various other metals. Italy's needs are probably the largest of Europe and yet there is a serious question whether or not much of them will be purchased in the United States. The distance from England is much shorter, and the location of the plants of continental producers is still closer.

France has received more consideration from American steel men than probably any other country and she has produced little business in return American exporters undoubtedly have wasted much good money in sending high-salaried agents to Europe to survey the field and to canvass it for orders. Now French officials state that the only real needs of metal by France during the coming year will be confined to about 100,000 tons of ship plates, and about 90,000 tons of copper. This modest demand is due to the extensive additions to French metal resources by the mines of Alsace-Lorraine. France not only will be able to meet all her domestic steel requirements but in time also to produce an exportable surplus of about 2,000,000 tons annually. The ship plates asked for are to assist in the rehabilitation of the shipyards of the country, whose output it is hoped to raise from 200,000 tons annually to 400,000 tons.

While chasing rainbows in Europe, American steel producers have been neglectful of their opportunities in South America. Prior to the war this country supplied South America with from 15 to 30 per cent of her imports. During 1916 it supplied nearly 40 per cent of imports for the entire

continent and this gradually has increased to 60 per cent. For more than four years South American markets have been greatly restricted in their purchases, and new construction has been halted. There is an active potential demand for building material, furniture, office supplies, electrical and railroad supplies, agricultural machinery and other products which are not available from home manufacture in the Latin countries.

Here is how one trade expert in the South American field, in an unbiased spirit, described it:

"The large number of orders cancelled the moment the armistice was announced showed plainly how slight was the hold we had gained and indicated, in part at least, the readiness of South American buyers to return at once to their former European trade connections. It is true that the difficulties in the war of satisfactory service were very great, as our exporters were hampered at every turn by war restrictions on shipping, cabling, correspondence and trading. The net result, however, is that we are now thrown back again to our former competitive position."

South Americans were willing to continue the friendly trade relations with the United States and last year sent several financial delegations to this country in an attempt to arrange for loans whereby new railroad construction could be initiated. American bankers were willing to extend the loans but the rate of interest demanded scared off the prospective customers. Now they have gone to England for a loan.

On the other hand, the American steel producer points with pride to the great volume of trade he has had during the past year with Japan and the Orient. It is true that some American agents traveled through the Orient and some new agencies were opened. On the other hand, the Japanese and Chinese have opened a branch trading house in the United States for every American sales branch established in their countries. If the truth were known it would probably be surprising to find out which have been the more successful, the American sales agencies established in the Orient or the purchasing agents the latter has placed in the United States. Selling here in the United States to foreign purchasers sent to this country smacks much of that other phase of our foreign trade, namely the shipping of our own goods in ships of a foreign nation. The great trade this country has had in iron and steel with the Orient during the past year has made the totals look promising, but it must not be forgotten that the great bulk of the iron and steel sold the Orient has left American ports in Japanese vessels. These buyers have come to our shores with money in their hand and have taken away purchases in their own ships.

Japan has obtained some valuable concessions out of the peace conference and she has purchased more concessions in Siberia. Mining engineers who have been on the field declare that Japan will be producing all the iron and steel she will need within the next five years. No reasonable man can look upon the Japanese purchases of today as being more than temporary.

All American steel exporters are not open to criticism for having neglected opportunities to build for the future in the safest though least spectacular way. The United States is beginning to suffer through the inexperience of newly-organized exporting houses. Laboring under the belief that anybody could engage in foreign trade, these concerns sent their representatives into overseas markets seeking orders, which came all too easily because of the depleted stocks throughout the shops of the world. Foreign merchants, assuming that they were dealing with responsible business men, placed their orders, and after long waits now are beginning to realize that they cannot expect deliveries.

Reputable export houses now are attempting to eliminate the irresponsible house and the speculator. The big producers gradually are adopting a preferential list of export agents to whom only will they sell. At the beginning of 1919 there were some 400 export houses in New York alone which purported to handle American iron and steel. Today the number of these houses which do any iron and steel business of importance can almost be counted on two hands.

Complaints of American export trade practices which have been heard from abroad undoubtedly are due to the activities of these irresponsible houses. Some of the fundamental complaints have recently been cited by H. E. Miller, proprietor of the Miller Brass Foundry, Torreon, Mexico. Mr. Miller emphasized the necessity of an exported maintaining a competent shipping and billing staff, such as has been built up by the United States Steel Products Co., the Consolidated Steel Corp. and other large American steel exporters.

"This is something that the majority of American firms absolutely refuse to do," said Mr. Miller. "It causes delay in the shipments, extra cost to the purchaser and dissatisfaction in general. Shipments to foreign countries go through custom houses at the port of entry, and each country has its rules which must be complied with. Generally the shipments are consigned to a customs broker designated by the foreign purchaser, and this broker must be supplied with shipping documents such as copy or original of the bill of lading, of invoice, packing list, etc. Export houses in Europe keep all this

WATER LINE BUILT ACROSS SINAI DESERT WITH AMERICAN MATERIAL

information and data on file, and even if specific instructions are not given with the order they make the shipment and papers correctly, so that there is little or no trouble at the end of the line when the goods arrive.

"Another thing that hurts the United States trade is the custom of substituting. This may work all right in the states, but not here. If a Mexican peon has been using a 'John Brown' plow with a red handle and likes it, he will want another just like it. If you show him exactly the same plow with a green handle he will not buy."

In foreign trade specifications are a most important factor. Not always will American standards be acceptable and this is a thing which some American producers have been inclined to ignore. Soon after the organization of the Consolidated Steel Corp. last year that organization adopted a new schedule of gages for sheets. This schedule was used successfully in the Orient by the Youngstown Sheet & Tube Co.

UNLOADING BALDWIN LOCOMOTIVE AT ORIENTAL PORT

Some foreign markets also prefer a different schedule of specifications for bars and pipe. England developed an important trade in South America with the result that English specification pipe is well known and adopted there. An American company entering a market already developed by steel manufacturers of other countries cannot expect to engage upon an equal basis of competition unless it is prepared to offer the customer the identical kind of goods he has been accustomed to receive. The American specifications would be new and not all peoples are willing to adopt new things with the readiness that American people are.

An illustrating incident is found in a sale of sheets. It has been discovered that a ton of English sheets includes a few more individual sheets than a ton of similar gage from America. The Birmingham standard for a No. 28-gage sheet, is .014-inch thick, whereas the American No. 28-gage sheet is .015625-inch thick. The result is merely a matter of mathematics. Naturally the ton of English No. 28-gage contains more sheets than a ton of similar American steel. Should a foreigner carry both the American and the English products in stock, he would find his retail purchaser taking the English sheets every time because he would think he was getting more for his money.

The United States Steel Products Co. quotes on exports inquiries a schedule of gages different from that which American steel mills use in domestic trade. International merchants, when moved to buy the American product, are not infrequently compelled to turn to the larger export companies for the goods because these organizations are prepared to meet the peculiar foreign specifications. Those export houses which have been most successful have been compelled to adapt their practices to the exigencies of the trade.

So-called English pipe, or gas tubes, differ from the American standard in weight and thread. The Argentine market has become accustomed to this especially light weight tube and the English have catered to this by rolling a lighter gage.

But one of the most peculiar specifications is that of a very popular wire in South America. This was introduced originally by the Germans who built up a trade in it which has been difficult to undermine. It is a rather high carbon wire and it is oval instead of round. The South American ranches ordered it galvanized. The oval shape is demanded because the ranchmen believe that cattle can see the oval-shaped wire better than the round. That is a peculiar belief of the ranchmen which Americans have found almost impossible to overcome. But some American manufacturers are beginning to cater to this demand. The Steel corporation was the first to supply this form of wire but now one or two other mills produce it.

These are but a few instances of the peculiarities of the export trade and furnish some indication of the difficulties confronted by the American exporter. From a study of these peculiarities of specifications, the American house has been able to learn much of the nature of the competition to be met in foreign markets. The past year has been an education along this line and that education has been promoted to the extent to which capable American sales agents have been sent abroad to study the situation. But the export house has found itself powerless in many cases to put its experience into practice unless the American manufacturer has shown a willingness to assist and to produce the kind of material that the foreigner desires. The attitude shown by some American mills has been not entirely dissimilar to the popular South American conception of the peculiar characteristic of the cow's sight. They see the oval wire and cannot distinguish the round.

Failure of the United States the past year to grasp all the opportunities in the foreign trade is not entirely due to the lack of proper coordination between industry and the merchant marine, or of co-operation between international bankers and steelmakers. There has also been lacking that full measure of co-operation between the mills and the export companies. The fact that sales during 1919 bulked so large is merely proof that the opportunities for American iron and steel abroad have been much larger than the whole industry elected to avail itself. With experience and organization such as is possessed by some of the foreign countries long engaged in the foreign trade like England, and the measure of co-operation between producer, exporter, financier and transportation, company as has been worked out in Great Britain, the United States would be recognized as facing the greatest future in its history insofar as the foreign iron and steel trade is concerned.

Fig. 1—Loading huge piles of by-product coke into railroad cars for shipment to the iron and steel industry

Seek to Escape Tyranny of Fuel

Manufacturers, Handicapped by Uncertainty of Supply, Realize Ton in Yard is Worth Two in Ground—Resources, While Adequate for Century, Must be Conserved—Use of Fuel Oil Grows

BY E. F. ROSS

FUEL is the very keystone of industry; yet the United States, endowed with over 50 per cent of the known resources of the world, frequently suffers because of inadequate supplies. Continued repetition of these experiences, of which the recent coal strike is a good example, is forcing home the truth that it is the amount of coal, petroleum and gas in the yard, rather than the latent stores in the ground, which governs industrial prosperity. As long as coal is mined according to the present practice, in quantities only sufficient for immediate needs, the country will continue to remain at the mercy of labor and transportation difficulties.

However, it is doubtful if advance stores can be accumulated under existing conditions. With production seriously curtailed because of the inability of the railroads to handle as much coal as could be mined, and with the United States exporting large tonnages to foreign countries as well as requiring abnormal supplies at home, producers will be hard pressed to keep up with the demand. Therefore, for a time at least, coal will be handled on a hand-to-mouth basis.

Immediate relief from the tyranny of fuel lies in conservation and in selecting fuel with a more intelligent consideration for the factors of available supply, distribution, and adaptability to the purpose for which it is required. Referring to a policy of wisdom for the administration of fuel, Franklin K. Lane, in the annual report of the secretary of the interior, advocates a thorough inventory of resources, a study of the availability of various fuels for immediate use, a campaign to guard against waste either through ignorance or wantonness, and an effort to prolong the life of fuel resources by invention and discovery.

United States Has Half of World's Fuel

IN a time of stress it is not enough to be able to say that the United States contains more than one-half of the known world supply of coal; that we, while only 8 per cent of the world's population, produce annually 46 per cent of all coal that is taken from the ground; that 35 per cent of the railroad traffic is coal; that in less than 100 years we have grown in production from 100,000 tons to 700,000,000 tons per annum; that if last year's coal were used as construction material it would build a wall as huge as the great wall of China around every boundary of the United States from Maine to Vancouver, down the Pacific to San Diego and eastward following the Mexican border and the coast to Maine again; and that this same coal contains latent power sufficient to lift this same wall 200 miles high in the air."—FRANKLIN K. LANE, *Secretary of the Interior.*

Coal, oil and gas constitute the important fuels used in the iron and steel industry. Of the three, coal stands out as the bulwark around which the manufacture of iron and steel has been developed to its present important position. The presence of great coal wealth east of the Mississippi has been responsible for wonderful industrial growth in that district, and it is not probable that any other fuel will displace it as the principal factor of manufacturing. As the basis of coke, which is indispensible to the iron industry, coal must continue to exert a powerful influence in Pennsylvania, Ohio, Indiana, Illinois and West Virginia, which lead in the production of iron and steel and are in the midst of the most productive coal fields.

Available and commercial coal in the United States aggregates approximately 1400 billion tons. Production for 1918, the largest in history, totaled 685,356,000 tons, an increase of 33,-

952,626 tons over 1917. War demands severely taxed the coal production, but following a brief slump during the first few months after the signing of the armistice, reconstruction work increased the requirements almost to the war time level. It is reasonable to believe that industry will continue to need proportionate supplies for peacetime manufacturing.

A study of production statistics shows that the coal output practically has doubled itself every 20 years and, since mining experts agree that losses in mining are about 50 per cent due to impossible veins and coal which must be left in the veins for support, production at this rate will exhaust the present supply not later than 2050. Some authorities claim the date will be as early as 2027.

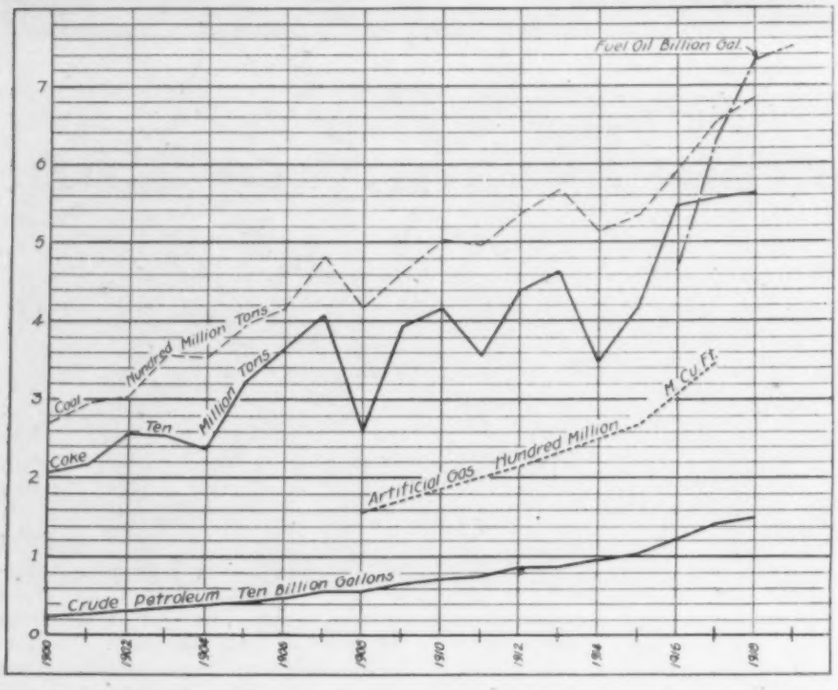


FIG. 2—CHART SHOWING PRODUCTION OF VARIOUS FUELS IN THE UNITED STATES FROM 1900 TO 1918. ACCURATE FIGURES ARE NOT YET AVAILABLE FOR 1919. NOTE THE REMARKABLE GROWTH OF FUEL OIL PRODUCTION

Will Exhaust Supplies

These estimates do not include the 1600 billion tons of inferior coal which at the present is not available economically but which must be exploited when the remaining commercial coal is exhausted. The same authorities maintain that if production continues to increase as it has in the past that even these supplies will be exhausted by the close of the next century. The accuracy of these forecasts is doubtful and in this connection it is interesting to note that the figures set 60 years ago in England for the duration of the coal supply already have been exceeded by over 200 per cent. The United States has 50 per cent of the world's coal supply or 21 times more than Great Britain. A recent book, "The Strategy of Minerals," edited by George Otis Smith, director of the United States geological survey, states that there need be no fear of the untimely exhaustion of the underground resources of this country.

Since 1916 the iron and steel industry has been consuming large quantities of fuel oil to replace the shortage of natural gas and even to supplant coal and coke to some extent. Each year has witnessed a remarkable increase in the use of liquid fuel and although the effect scarcely is noticeable yet in the fuel oil market, an increased consumption has resulted from the coal strike.

Since fuel oil is the newest industrial fuel to be used, statistics on its production have been compiled only since 1916. Its use as a marine fuel has brought it rapidly to the front and consumption has risen at a remarkable rate although the proportionate increase each year has been less than during the preceding year. It has been estimated that two-fifths of the crude petroleum produced in the United States is fuel oil but the ratio for the years 1917 and 1918 indicate 47 per cent as a more reliable figure. Reserves of crude petroleum are estimated to be 15 billion barrels which at the present rate of consumption will be exhausted before the middle of the present century. These stores do not include the shale oil resources, which on account of their expensive reduction, cannot be produced economically at this time. In spite of the fact that geologists agree closely after extensive estimating that petroleum at the present yield will be exhaustd within 30 years, there is such an element of mystery in the hiding of the underground liquid fuel that it may not be erroneous to conclude that this fuel will become a permanent factor in the development of the world.

Gas Supplies Inadequate for Needs

It has been commonly believed that natural gas production has been on the decline for the past few years while, as a matter of fact, more natural gas was consumed in 1917 than in 1916, the figures being 795,110,376 and 753,170,253 thousands of cubic feet respectively. This belief no doubt has resulted from the fact that industry has grown by such leaps and bounds that the reserves of natural gas did not permit the production to keep pace with it and other fuels had to be employed. Natural gas supplies have been situated in the same regions as coal supplies, both fuels being most economical for the iron and steel industry. Gas has had so many uses and has cost so little that enormous quantities have been consumed by the industry. The largest sources of natural gas have been West Virginia, Pennsylvania, Ohio and Oklahoma. Within recent years few new pockets have been discovered, and as the result the present pockets probably will be early exhausted. It is predicted that the supply will fail within 20 years unless industry, which consumes at least two-thirds of the total production, makes lighter demands upon it.

Aside from coal, oil and natural gas, including their derivitives, no other fuel or substitute for fuel has been found practicable for use in the iron and steel industry in the United States. The increasing utilization of water power in several foreign countries, notably Norway, Sweden and Italy, suggests the possibility of harnessing the streams of the South, the Pacific slopes and New England to obtain power for electric furnaces. The regions where power can be easily developed are far removed from the industrial centers of the nation, but it is possible that other factors may compensate for this handicap and permit highly specialized industries to be created.

Thirty million water horsepower are readily available in the United States and by the construction of reservoirs perhaps 150 to 200 million more could be made available. In

1912 it was estimated that of the 31½ million horsepower used in this country 5½ million were supplied by water and the remaining 26 million by steam. Authorities claim that one water horsepower will save 10 tons of bituminous coal per year. However, over 70 per cent of the available water power is west of the Mississippi river whereas almost the entire iron and steel industry is east of the Mississippi. Moreover, 70 per cent of the total water horsepower now installed in prime movers is installed in the latter area. Many large industrial areas now use no water power and would obtain little or none under the most thorough development. As a result, these areas must continue to employ coal and other mineral fuels.

It is difficult to obtain an estimate of the average cost of water power because each location of a power site has its own solution. Unquestionably it is the cheapest source of power in the country because thus far only the most advantageous sites have been developed. In spite of all of this and present day propaganda, water power development is severely restricted.

The federal government is unwilling to develop and supply common power as a government project and since the rivers are subject to federal jurisdiction, such rigid and undesirable legal restrictions are made against development by public service corporations that relatively few projects are organized and carried into effect.

From the foregoing resume of the available resources of fuel in this country it is evident that industry can depend on suitable supplies of coal and petroleum for many years. Natural gas will steadily decline in importance as an industrial fuel, while the possibilities of water power as a substitute are not sufficiently known to be considered a factor of immediate importance.

A study of the availability of the various fuels for immediate use, the second step proposed by the secretary of the interior, may be interpreted to include the consideration of the applications of each kind of fuel. Inasmuch as iron and steelmaking must depend largely upon coal for many of its needs, it is necessary, in order to conserve the supply for these requirements, to turn to other fuels wherever substitution is possible. The most promise in this direction lies in the adoption of fuel oil to supplant coal for many of the operations which do not require coke.

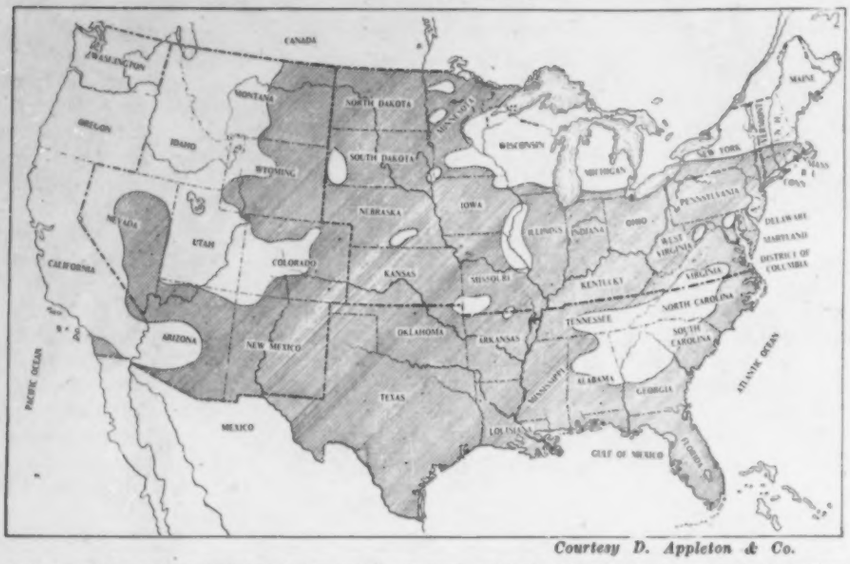
The use of fuel oil offers many possibilities. It has been successfully applied to many operations including forging, annealing, melting and open-hearth furnaces, ingot heating, billet heating, rivet heating, tempering, hardening, skin drying, brazing, enameling and core ovens. The chief advantages claimed for fuel oil are uniformity of product, better control of the chemical content of the iron than is possible in a hand-fired coal furnace, ease with which heats can be controlled and oxidation regulated, decrease in labor and maintenance costs, less difficulty with burned-out stacks and furnaces, and the desirable soft soaking heat obtained by the use of oil.

FIG. 3—MAP SHOWING THE DISTRIBUTION OF COAL RESOURCES IN THE UNITED STATES. IRON AND STEEL AND COAL CENTERS ALMOST COINCIDE

An analysis of iron and steelmaking equipment completed or under construction in 1919, shows that practically all of the important installations of oil-burning equipment were either in the Middle West, conveniently near to the oil fields, or on the Atlantic seaboard where this liquid fuel is easily obtained by way of water transportation. The number of open-hearth furnaces using fuel oil is increasing gradually, particularly in the industrial district in the neighborhood of St. Louis and Kansas City. The employment of fuel oil also is becoming popular in the New England states, where in the past industry has been at the complete mercy of coal.

Although it is reasonable to believe that fuel oil will be used most extensively in the districts already mentioned there are numerous furnaces and ovens close to the supplies of coal. In many localities, even where cheap coal is available, liquid fuel is preferred for small melting units and for heating accessory furnaces. In all parts of the country the installation of fuel oil equipment is due largely to the fact that it is easily handled and does not require

FIG. 4—MAP SHOWING THE DISTRIBUTION OF OIL AND GAS RESOURCES TOGETHER WITH PRINCIPAL PIPE LINES OF THE UNITED STATES



Courtesy D. Appleton & Co.

FIG. 5—MAP SHOWING SOURCES OF POWER IN UNITED STATES. SHADED AREA IS THAT IN WHICH GREATER PART OF POWER IS DERIVED FROM FUELS; UNSHADED AREA IS THAT IN WHICH THE GREATER PART IS DERIVED FROM WATER

the amount of manual labor involved in the handling of coal.

Undoubtedly the use of fuel oil was given a great impetus by the recent coal strike. Numerous cases are known of manufacturers who improvised oil burning furnaces in order to bridge the lack of coal. No doubt many of the manufacturers who turned to petroleum for relief in this emergency will specify oil burning equipment when ordering for future requirements.

Waterpower as a substitute for coal has not been developed except in a few isolated cases, but it promises to assume greater importance than heretofore on account of the growing popularity of the electric furnace. One notable installation of electric furnaces which derive electricity from water power is that of the United States Ferro Alloys Corp., Niagara Falls, N. Y. A number of electric furnaces in the South and West also are dependent upon water power instead of coal. Most of these are employed in the manufacture of ferroalloys.

Making Electric Pig Iron

Electric pig iron has not been made to any great extent in this country. Twelve furnaces for this purpose are operating in Sweden and produce a total of about 500 tons per day. This method as far as Sweden is concerned is a national economy for the water power supplys cheap electricity and the supply of charcoal, which is limited to about one million tons per year, will make three million tons of pig iron by the electric method, whereas only one million tons can be produced in blast furnaces with the same amount of charcoal. When the relatively cheap coke of this country is no longer available, the electric furnace method may receive greater support here.

Conservation of resources should receive more attention than ever before. Fuels have been used wastefully ever since fuel was discovered and only during recent years has science pretended to secure more economical utilization of natural resources. Not many years ago natural gas was allowed to escape when a pocket was discovered in prospecting for oil. Today, means are available for capping such pockets. Until supplies of gas began to fall short, municipal lights were permitted to burn 24 hours a day and the public made no pretense toward conservation. In the early mining of coal in this country large quantities of the fuel was lost by carelessness and ignorance. Although the waste has been considerably reduced by means of education and the introduction of better facilities for removing the coal, there still is need of the utmost care in this respect.

Two ways by which the greatest volume of coal can be saved are the discovery of methods which give greater power per ton used and the discovery of what kind of coal is best fitted for any particular use. It has been shown and is true that the heat energy transformed into power by the most efficient machines is alarmingly small compared with the total heat energy contained in the coal.

Recommendations have been made that the government sample and certify coal. It has been done with other commodities with entire satisfaction. At the present inferior grades of coal are being sold as first-class coal with the result that the better grades of fuel are discounted in value. Congress is expected to act upon a bill providing federal inspection of coal and should the bill become a law with the whole-hearted support of industrial organizations, public interests will be well guaranteed. Unfair mines by this means will be weeded out and present irregularities abolished.

Much of the burden of conservation must be shared by the consumers of fuel. In 1700, forty pounds of coal were required to produce one horsepower hour while in 1918 the amount of coal required had been reduced to 1.1 pounds. This improvement was made only after 200 years of experience but at that the best engineering practice of today makes available as electric energy only little more than 20 per cent of the heat of coal and perhaps only 25 per cent of the energy of natural gas. Thus it is evident that science still has a tremendous task ahead in reducing to a minimum the amount of fuel required per unit of power.

Secretary Lane advocates prolonging the life of fuel resources by invention and discovery. Perhaps no manufacturing group has contributed more to the invention and development of fuel-saving devices than that of the iron and steel industry. By-product coke making, the utilization of coke oven and blast furnace gas, and the employment of pulverized coal are noteworthy examples of the methods developed to increase the efficiency of fuels used in the metallurgical industries.

By-Product Method Gains Favor

The early practice of making coke was by the beehive oven, in which the volatile elements were driven from the coal without any pretense toward recovery. Being inexpensive, this method remained in favor even after the by-product oven was introduced, as the latter required a bulk of apparatus and was comparatively expensive. Producers gas was more costly than natural gas and was in little demand while the gas fields were highly productive. Other by-products, including toluol, were not in demand while the production of crude petroleum was able to supply the demand for the lighter fuels. When the war broke out the demand for coke and toluol was accelerated, and the building and operation of by-product ovens received an impetus. By-product ovens have increased in number each year since 1894, while beehive ovens have been decreasing until now

the production of coke by each method is approximately the same.

Modern retort ovens produce more coke from coal than the beehive ovens. The by-product ovens yield half of their outgoing gas as surplus, whereas the beehive ovens yield no surplus. By-product gas adapts itself to the scrubbing process by which the precious residuals are extracted profitably.

Impartial authorities have stated that no reason exists for preferring beehive coke for blast-furnace uses although some crucible steel makers have insisted on coke produced by the latter method. Some English authorities recommend that insofar as possible all bituminous coals should be subjected to a coking or semicoking process at a comparatively low temperature so that the by-products are not wasted. It has been estimated that each ton of coal is capable of yielding three-fifths of a ton of semicoke, three gallons of motor fuel, one gallon of naphtha, two gallons of heavy fuel oil, 80 pounds of pitch and about 20 pounds of ammonium sulphate.

Gas, including by-product and natural gas, has a wide range of use in the iron and steel industry, it being estimated that 28 per cent of all gas, not including blast furnace gas, is used by this industry. By-product gas is employed in the operation of open-hearth furnaces, heating furnaces, annealing furnaces, soaking pits and is used to some extent for drying purposes. Being somewhat more costly than other fuels its use in power generation is comparatively limited.

Blast furnace gas, which is generated in large volumes in the blast furnace, is used almost entirely in the maintenance of the blast-furnace plant and since many of these plants are not operated in connection with steel and rolling mills, it is not practicable to pipe the gas to the remainder of the industry. A constant volume of this gas is not generated and since the blast-furnace plant consumes varying quantities, constant supplies can not be guaranteed for other purposes.

Powdered coal has passed the stage of experiment and is fast taking its place among industrial fuels. Its use has been extended to many operations in the iron and steel industry. In certain installations the results obtained have indicated great possibilities and future developments should result in much broader applications to various types of coal burners.

Noteworthy progress in the installation of powdered coal has been made in the sheet mills of the country. Supplies of natural gas were available for many sheet mills when they were built, but since that time the gas has failed. Many mills were compelled to return to coal-burning, hand-fired furnaces, a method wasteful and unsatisfactory for many other reasons. In the past few years, however, powdered coal has been employed successfully in all departments of sheet mill plants. Many establishments, especially along the Ohio river, in Ohio, West Virginia and Pennsylvania, are using powdered coal for galvanizing pots, and in slab, sheet and pair, and annealing furnaces, with satisfactory results.

FIG. 6—REMARKABLE VIEW OF OIL FIELD NEAR BURKBURNETT, TEXAS, SHOWING GREAT ACTIVITY ACCOMPANYING TYPICAL AMERICAN OIL BOOM

Expect Good Year in Ore Trade

Operators Believe Great Improvement is Certain Unless More Labor Troubles Retard Operations of Furnaces—Past Season's Shipments 14,000,000 Tons Less Than in 1918—Reserves 35,787,846 Tons Less—Developments on the Ranges

BY A. J. HAIN

EXCEPT for some uncertainty as regards the labor situation, the outlook for the iron ore trade is much more favorable for 1920 than was the prospect for the season of 1919 as faced by the operators in January a year ago. At that time when industries were entering a period of readjustment it was generally anticipated that shipments in 1919 would amount to considerably less than in 1918, a year in which the war gave much impetus to the movement. And expectations were fully confirmed when to the difficulties of readjustment were added those of labor disturbances. Such circumstances served to reduce lake shipments of 61,156,732 tons in 1918 to 47,177,395 in 1919, a loss of 13,979,337 tons.

Operators are not so much disposed at this time to contemplate the past as they are to look ahead, and in taking all factors into consideration they are convinced that 1920 will be a prosperous year if no untoward events develop to disturb industry. With a great potential demand for pig iron, mine operators see far-reaching possibilities just ahead, but among them all is discernible the uncertainty regarding labor. Nowhere is the discouraging, halting influence more pronounced than on the ranges of the Lake Superior district.

While operations of mines and development work were seriously hindered by strikes on the ore docks and at the furnaces, the mining industry itself experienced little labor trouble in 1919. The strike of ore handlers at ports at the upper lakes delayed shipments for about a month and was the principal cause for the suspension of four mines on the Mesabi range. The only strike which occurred among the mine workers was confined to Ely, where 500 men went out a few days after the steel strike was begun. These men gave as their reason for striking that they preferred an hourly wage scale to a contract wage, but after remaining out about a month they said organizers of the Industrial Workers of the World had misled them, and they went back on original terms.

Table I

Approximate Shipment by Ranges

	1919	1918
*Mesabi	31,479,191	40,396,711
*Vermilion	880,867	1,192,908
*Cuyuna	1,805,751	2,478,800
Total Minnesota	34,165,719	44,068,419
*Gogebic	5,915,383	7,936,701
*Marquette	2,667,842	4,354,207
*Menominee	4,428,651	6,378,698
Mayville, etc.	75,000	98,057
Misc. shipm'ts by rail	1,600,000	†
Grand total	48,852,395	62,836,082

*Includes lake shipments only in 1919.
†Absorbed in range figures for 1918.

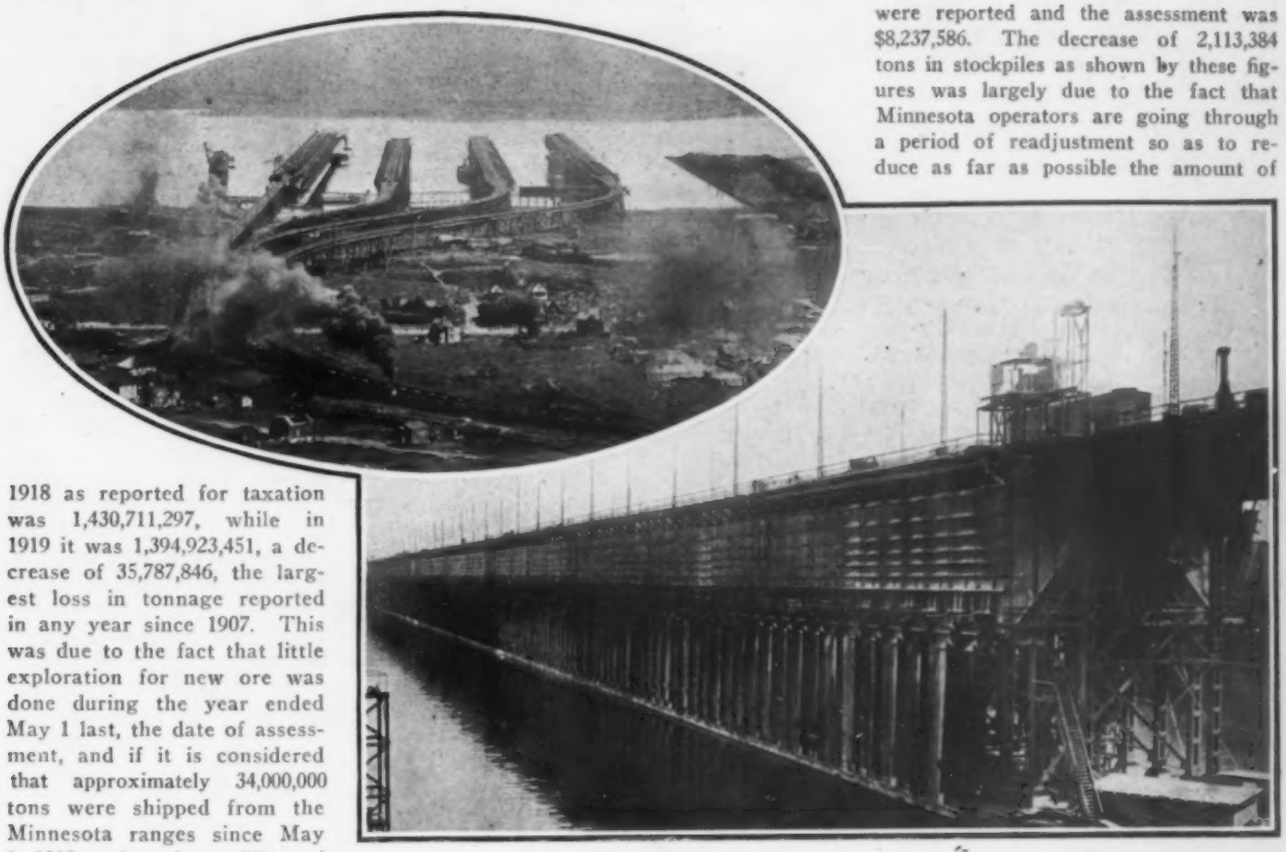
The I. W. W. is intensively active at present in northern Minnesota and the federal authorities recently dispatched special investigators to that district. The writer recently saw a number of pay checks showing that common laborers at the mines of one of the largest operating companies received $150 a month, and others showing that some of the skilled men received from $300 to $400 a month. The high wages paid on the ranges are expected to prove the most effective barrier against the influence of the agitators, but of course they are no safeguard against idleness which maye be due to strikes elsewhere.

Although exploration and development work was at low ebb during the past season there are many indications that the operators are going ahead in anticipation of a busy season. The leading independents as well as the Oliver Iron Mining Co., subsidiary of the United States Steel Corp., are keeping their crews intact, conducting stripping operations, sinking new shafts or doing other work in preparation for the opening in the spring of mines which were idle last year. While conditions which develop will determine the extent of operations, nevertheless the word has been passed along: "Be prepared."

* * *

THE year 1919 was notable for the loss of tonnage of merchantable iron ore in the ground. The total in

NEW WASHING AND CRUSHING PLANT OF THE OLIVER IRON MINING CO., AT EVELETH, MINN.



LARGEST ORE DOCK IN WORLD PUT IN COMMISSION AT DULUTH LAST SEASON. THE DOCK IS AT THE LEFT OF THE FOUR MODERN DOCKS SHOWN IN THE UPPER ILLUSTRATION

1918 as reported for taxation was 1,430,711,297, while in 1919 it was 1,394,923,451, a decrease of 35,787,846, the largest loss in tonnage reported in any year since 1907. This was due to the fact that little exploration for new ore was done during the year ended May 1 last, the date of assessment, and if it is considered that approximately 34,000,000 tons were shipped from the Minnesota ranges since May 1, 1919, only a few million of which were shipped from stockpile, the present loss in tonnage becomes more appreciable.

The first assessment equalized by the state tax commission in 1907 revealed 1,191,969,757 tons, and the assessed value was placed at $191,706,682. No records of tonnage in the ground are available previous to that date, but since then approximately 420,000,000 tons of iron ore have been shipped from Minnesota. Despite this large depletion, according to the tax commission, the 1919 record of merchantable ore in the ground is 202,953,694 tons greater than that of 1907 and the assessed value is $97,233,693 greater, due to the development of new ore bodies and increased tonnages discovered in mines already operating.

The 1919 assessed value of all land in Minnesota containing merchantable iron ore is $282,109,811 as compared to $295,102,890 in 1918, the decrease being $12,993,079. These figures include assessments for structures and a nominal assessment for surfaces, these combined amounting to $1,490,064 for 1919. Eliminating such assessments in both instances, the assessed value of merchantable iron ore was $293,602,140 in 1918 and $280,619,747 in 1919, a decrease of $12,982,393. The reduction was brought about largely through the revision in valuation of the manganiferous ore properties.

In addition to the merchantable tonnages measured by the tax commission there are approximately 175,000,000 tons of iron ore of record in the tax commission's office, the grade and character of which are such that present market standards and conditions make it nonmerchantable, but at some future time this ore may have a market value. The 1919 assessment of ore in the ground by counties, including the nominal amounts for buildings and surfaces, follows:

	Tons	Valuation
St. Louis	1,180,822,166	$258,663,231
Itasca	135,195,645	18,942,319
Lake	77,000	39,750
Crow Wing	58,828,640	4,464,511
	1,394,923,451	$282,109,811

Iron ore is assessed for taxation at one-half of full value in accordance with the classified assessment law of Minnesota, while other properties are assessed at from 25 to 40 per cent. Iron ore in stockpile at the mines is assessed as personal property, also at 50 per cent of full value. The amount on hand May 1, 1919, was 4,912,403 tons, assessed at $6,827,419. In 1918 7,025,787 tons were reported and the assessment was $8,237,586. The decrease of 2,113,384 tons in stockpiles as shown by these figures was largely due to the fact that Minnesota operators are going through a period of readjustment so as to reduce as far as possible the amount of ore in stock, because under the state law a tax of $1.40 must be paid on every ton of ore in stock.

Although the tonnage tax proposal in Minnesota was defeated last year by veto of the governor, the issue is still one of the most vital in the state and the measure undoubtedly will come before the legislature at its regular session in January, 1921, if it is not brought up earlier at a special session now proposed. The personnel of the house, in which branch the advocates of the bill were particularly strong, will be changed before the next regular session but the senate holds over and in that body the last bill proposed was passed by a vote of 38 to 28. The governor's veto was sent to the legislature too late to permit that body to act before adjournment, and only this fact, it is said, prevented the imposition of a supertax.

Of the total shipments, 48,852,395 tons, from the mines in Lake Superior district during 1919 the Oliver company shipped approximately 21,500,000, or 44 per cent. In 1918, the comparative figures were 62,836,082 and 26,178,782 or 41.66 per cent. The independents shipped 27,352,395 tons in 1919 as compared with 36,657,300 tons in 1918, a decrease of 9,304,905 tons, as compared with a decrease of approximately 4,678,782 tons in shipments of the Oliver company. Total shipments from

Table II

Reserves by Ranges

Ranges	1919	1918
Mesabi	1,325,035,574	1,356,419,129
Vermilion	11,059,237	11,777,208
Cuyuna	58,828,640	62,514,960
Total tonnage..	1,394,923,451	1,430,711,297

the Lake Superior district by months for 1918 and 1919 were as follows:

	1919	1918
April	1,412,239	235,870
May	6,615,341	8,792,231
June	7,980,839	9,921,860
July	9,173,429	10,659,203
August	4,423,133	9,725,331
September	8,178,483	8,995,014
October	6,201,883	8,341,593
November	3,152,319	4,279,025
December	46,662	6,836

The tonnage of iron ore remaining on dock at Lake Erie ports on Dec. 1, 1919, was substantially the same as on Dec. 1, 1918, the comparative figures being 10,454,843 tons in 1919 and 10,376,509 tons in 1918. Shipments from the docks to Dec. 1 were about 10,000,000 tons less in 1919 than in 1918, amounting to 35,747,256 tons in 1918, and 25,306,777 tons in 1919.

Owing to the steel and coal strike, most of the mines went on a winter basis about a month earlier than usual, and after Oct. 15 ore went from the mines to the docks only for distinctly ordered craft. The ore fleet felt the influence of the slow shipping movement. No new vessels were brought into service during 1919. For two years now the size of the fleet has remained stationary, but several new carriers are under contract. The fleet has proved adequate for handling a heavy season's requirements.

* * *

ONE of the most important projects under way on the Minnesota ranges is the clearing of the northerly 40 acres of the business and resident district of Hibbing to permit of the extension of the great open pit properties operated by the Oliver Iron Mining Co. For many years, the most densely populated district of Hibbing has been surrounded by open pits, making it impossible for the village to expand on its original site. The northerly extremity extends out thumb-shaped and somewhat like a plateau, some of its buildings being perched on the edge of the wide gorge hewn deep in the earth. Since the original townsite was laid out the mines have steadily encroached on it, the Sellers from the north and east and the Rust from the west.

The Oliver company acquired right to the minerals under the northerly 40 acres by lease in 1899, and two years ago the company began to buy the surface rights. It paid $2,500,000 for those rights and today owns all but 30 lots and buildings thereon of an area of more than eight city blocks, practically a third of the resident and business district of Hibbing having a population of about 5500.

While the purchases were being made it became necessary for the company to find a new location for that part of the village that was to be transplanted. Two miles south, across the Hull pit, it laid out the Central addition to Hibbing, the new "Alice location," so called because the district once was incorporated under that name, although now within the limits of the village of Hibbing. Here it began to build a model town, having ample space in which to grow, and which is now growing by leaps and bounds.

The village has built a power plant

THAT SECTION OF HIBBING ABOVE THE HEAVY DOTTED LINE IS BEING MOVED TO THE CENTRAL ADDITION

and heating system, now nearing completion, at a cost of $1,000,000. The Oliver company has just completed a brick and concrete hospital, four stories in height, at a cost of about $350,000 which probably will be the best equipped hospital in the state of Minnesota. The company also has erected four double brick store buildings and has let a contract for a 142-room hotel. Two new school buildings are to be erected, while private parties are erecting large mercantile buildings. It is estimated that of Hibbing's 18,000 population, 10,000 persons will live in the new district, while previously but 4000 lived in the entire portion of the village south of the Hull pit.

Recently 15 persons residing in the southern end of the business and resident district, the Pillsbury and Southern additions, and in the townsite of Stuntz, just outside of the village, began an action against the Oliver company, the village of Hibbing and the Mesaba Electric Railway Co., to enjoin the village from disposing of its property in the original townsite, enjoining the vacation of streets, enjoining the railway company from removing its tracks and enjoining the Oliver company from doing certain things which would permit the mining of the northerly 40 acres. They suggested that the Oliver company purchase their property, but it has no interest in the ore underlying the Pillsbury or Southern additions. The application for a temporary injunction was argued Nov. 28 and 29 and was taken under advisement.

For many years the Great Northern Railroad Co.'s tracks entering Hibbing have skirted the southerly edge of the Hull-Rust mine for a distance of about a mile and a half. The Great Northern held this right of way, subject to mineral reservations. The Oliver company indicated to the company that the location of the tracks was delaying mining operations in the Hull-Rust mine and preventing its extension to the south. Accordingly, the Great Northern made an application to the Minnesota railroad and warehouse commission for leave to abandon the tracks and its station in Hibbing and to enter the village over the tracks of the Duluth, Missabe & Northern Railway Co., at the southerly edge of the southern addition, and nearer the new central addition. This application was granted and the railroad company started to tear up the tracks, the Oliver company's stripping shovels following quickly along and tearing up the roadbed. The plaintiffs in the original injunction suit rushed back into court to stop this work, and the case is still hanging fire.

The Oliver company started moving buildings to the new location last year and up to Dec. 1 had moved about 25 dwellings, and had torn down 10 others. Other buildings have been prepared for moving, the company having spent $132,000 in moving operations to date. About 85 dwellings, 12 frame business buildings and eight brick business blocks are to be moved, and the moving of some of these larger buildings present difficult problems. For instance, the city hall, the finest and largest building which will be moved, is 75 x 144 feet, three stories in height, having been built in 1908 at a cost of $167,000. To move this

NAMES OF OPERATING COMPANIES AND LOCATION OF CONSUMING FURNACES

ILLINOIS

Chicago
- By-Products Coke Corporation
- Illinois Steel Company
- Steel & Tube Co. of America (Iroquois)
- Miami Metals Co.
- Wisconsin Steel Co.

INDIANA

Gary
- Indiana Steel Co.

Indiana Harbor
- Inland Steel Co.
- Steel & Tube Co. of America (Mark)

KENTUCKY

Ashland (See Ironton, Ohio District)

Middlesboro
- Virginia Iron, Coal & Coke Co.

MICHIGAN

Boyne City
- Charcoal Iron Co. of America

Cadillac
- Mitchell-Diggins Iron Co.

Detroit
- Detroit Furnace Co.
- Detroit Iron & Steel Co.

East Jordan
- East Jordan Furnace Co.

Gladstone
- Cleveland-Cliffs Iron Co.

Mancelona
- Antrim Iron Co.

Manistique
- Charcoal Iron Co. of America

Marquette
- Pioneer Iron Co.

Newberry
- Charcoal Iron Co. of America

Wells
- Stephenson Charcoal Iron Co.

MINNESOTA

Duluth
- Minnesota Steel Co.
- Zenith Furnace Co.

MISSOURI

Mildeo
- Midcontinent Iron Co.

Sligo
- Sligo Furnace Co.

St. Louis
- Mississippi Valley Iron Co.

NEW JERSEY

WHARTON DISTRICT

Stanhope
- Musconetcong Iron Works

Wharton
- Wharton Steel Co.

NEW YORK

Buffalo
- The Buffalo Union Furnace Co.
- Donner Steel Co.
- Lackawanna Steel Co.
- Rogers-Brown Iron Co.
- Wickwire Steel Co.

Charlotte
- McKinney Steel Co. (Genesee)

North Tonawanda
- Donner Steel Co.

Troy
- The Buffalo Union Furnace Co.

OHIO

Bellaire (See Wheeling, W. Va. District)

Canton
- United Furnace Co.

Cleveland
- The American Steel & Wire Co. (Central & Emma)
- Cleveland Furnace Co.
- McKinney Steel Co.
- The Upson Nut Co.

Columbus
- Carnegie Steel Co.
- The American Rolling Mill Co.

Culbertson (See Ironton O. District)

Dover
- The Penn Iron & Coal Co.

Girard (See Youngstown District)

Hamilton
- The Hamilton Furnace Co.

Hanging Rock (See Ironton District)

Hubbard (See Youngstown District)

IRONTON DISTRICT

Ashland, Ky.
- Ashland Iron & Mining Co.
- Norton Iron Works.

Culbertson
- The Marting Iron & Steel Co. (Lawrence)

Hanging Rock
- The Hanging Rock Iron Co.

Ironton
- Belfont Iron Works
- The Kelly Nail & Iron Co.
- The Marting Iron & Steel Co. (Marting)
- The Marting Iron & Steel Co. (Ironton)
- Union Furnace Co.

JACKSON DISTRICT

Jackson
- Globe Iron Co.
- The Jackson Iron & Steel Co.
- Star Furnace Co.

Wellston
- Wellston Iron Furnace Co.
- Milton Iron Co.

Leetonia
- McKeefrey Iron Co.
- United Iron & Steel Co. (Cherry Valley)

Lorain
- The National Tube Co. of Ohio

Lowellville (See Youngstown District)

Martins Ferry (See Wheeling, W. Va. District)

Mingo Junction (See Steubenville District)

New Straitsville
- The Bessie Furnace Co.

Niles (See Youngstown District)

Leesport (See Reading District)

Macungie (See Bethlehem District)

Marietta
- Lavino Furnace Co.

McKeesport (See Pittsburgh District)

Midland
- Pittsburgh Crucible Steel Co.

MONESSEN DISTRICT

Donora
- The American Steel & Wire Co.

Monessen
- Pittsburgh Steel Co.

Neville Island (See Pittsburgh District)

Newcastle
- Carnegie Steel Co.
- Republic Iron & Steel Co. (Atlantic)

Newport
- Juniata Furnace & Foundry Co.

Parryville
- Carbon Iron & Steel Co., Ltd.

PITTSBURGH DISTRICT

Bessemer
- Carnegie Steel Co. (Edgar Thomson)

Clairton
- Carnegie Steel Co.

Etna
- Carnegie Steel Co. (Isabella)

McKeesport
- National Tube Co. (Monongahela)

Neville Island
- Carnegie Steel Co.

Pittsburgh
- The American Steel & Wire Co. (Schoenberger)
- Carnegie Steel Co. (Edith)
- Carnegie Steel Co. (Lucy)
- Clinton Iron & Steel Co.
- Jones & Laughlin Steel Co.

Rankin
- Carnegie Steel Co. (Carrie)

South Duquesne
- Carnegie Steel Co. (Duquesne)

Punxsutawney
- Punxsutawney Furnace Co.

READING DISTRICT

Birdsboro
- Brooke (The E. & G.) Iron Co.

Leesport
- Leesport Furnace Co.

Pottstown
- The Eastern Steel Co.

Reading
- Reading Iron Co.

Temple
- Seaboard Steel & Manganese Co.

Topton
- Empire Steel & Iron Co.

Saxton
- Thropp, Jos. E.

Scottdale
- McKinney Steel Co.

SHARON DISTRICT

Farrell
- Carnegie Steel Co.

Sharon
- Carnegie Steel Co.
- Republic Iron & Steel Co. (Hall)
- Stewart Iron Co. (Ltd.)

Sharpsville
- Claire Furnace Co.

A K E S U P E R I O R

C O N S I N

M I C H I G A N L A K E

C

Michipicoten

429.

75.

504.

34.

0.01

0.8

539.

Marquette

34.

0.4

Newberry

0.12

532.

M

Marquette Range

Menominee Range

I

0.6

0.4

0.7

Gladstone

Wells

Escanaba

Manistique

03.

C

54.

102.

13.

0.2

0.3

Boyne City

East Jordan

0.4

Mancelona

H I G H

L A N D

0.7

Cadillac

115.

0.1

0.1

Mayville

Baraboo Range

Mayville Range

0.02

0.02

0.02

Madison

Milwaukee

Grand Rapids

Lansing

113.

0.05

61.

0.2

0.1

14.

Chicago

Indiana Harbor

0.2

38.

Gary

Michipicoten

Moose Mountain

Sault Ste.Marie

Newberry

Manistique

Boyne City

East Jordan

Mancelona

Cadillac

Grand Rapids

Lansing

Parry Sound

Midland

Toronto

Hamilton

Point Edward

Port Colborne

Lake St.Clair

Detroit

Erie

Conneaut

Ashtabula

Fairport

Toledo

Cleveland

Lorain

Huron

SHARON DISTRICT

YOUNGSTOWN

Youngstown

Middlesex

L

A

MAP SHOWING
DISTRIBUTION OF
LAKE SUPERIOR IRON ORES
AND LOCATIONS OF CONSUMING FURNACES
SEASON 1918

Supplement to the Annual Edition
of
THE IRON TRADE REVIEW
Jan. 1, 1920

Chart Prepared By
Lake Superior Iron Ore Association, Cleveland
And Published by Courtesy of That Organization

Culbertson (See Ironton O. District)
Dover
The Penn Iron & Coal Co.
Girard (See Youngstown District)
Hamilton
The Hamilton Furnace Co.
Hanging Rock (See Ironton District)
Hubbard (See Youngstown District)

IRONTON DISTRICT
Ashland, Ky.
Ashland Iron & Mining Co.
Norton Iron Works.
Culbertson
The Marting Iron & Steel Co. (Lawrence)
Hanging Rock
The Hanging Rock Iron Co.
Ironton
Belfont Iron Works
The Kelly Nail & Iron Co.
The Marting Iron & Steel Co. (Marting)
The Marting Iron & Steel Co. (Ironton)
Union Furnace Co.

JACKSON DISTRICT
Jackson
Globe Iron Co.
The Jackson Iron & Steel Co.
Star Furnace Co.
Wellston
Wellston Iron Furnace Co.
Milton Iron Co.

Leetonia
McKeefrey Iron Co.
United Iron & Steel Co. (Cherry Valley)
Lorain
The National Tube Co. of Ohio
Lowellville (See Youngstown District)
Martins Ferry (See Wheeling, W. Va. District)
Mingo Junction (See Steubenville District)
New Straitsville
The Bessie Furnace Co.
Niles (See Youngstown District)
Portsmouth
Whitaker-Glessner Co.

STEUBENVILLE DISTRICT
Mingo Junction
Carnegie Steel Co.
Steubenville
Carnegie Steel Co.
La Belle Iron Works

Struthers (See Youngstown District)
Toledo
Toledo Furnace Co.
Wellston (See Jackson, O. District)

YOUNGSTOWN DISTRICT
Girard, O.
A. M. Byers Co. of Ohio
Hubbard
Youngstown Sheet & Tube Co.
Lowellville
Sharon Steel Hoop Co.
Niles
Carnegie Steel Co.
Struthers
The Struthers Furnace Co.
Youngstown
The Brier Hill Steel Co.
Republic Iron & Steel Co. (Hazelton)
Republic Iron & Steel Co. (Hannah)
The Youngstown Sheet & Tube Co.
Carnegie Steel Co. (Ohio)

Zanesville
Carnegie Steel Co.

PENNSYLVANIA

Alburtis (See Bethlehem District)
Bessemer (See Pittsburgh District)

BETHLEHEM DISTRICT
Alburtis
The Thomas Iron Co. (Lock Ridge)
Catasauqua
Empire Steel & Iron Co. (Crane)
Emaus
Reading Iron Co.
Hellertown
The Thomas Iron Co. (Saucon)
Hokendauqua
The Thomas Iron Co.
Macungie
Empire Steel & Iron Co.
South Bethlehem
Bethlehem Steel Co.

Birdsboro (See Reading District)
Catasauqua (See Bethlehem District)
Chester
Delaware River Steel Co.
Clairton (See Pittsburgh District)
Coatesville
Midvale Steel & Ordnance Co.
Cornwall (See Lebanon District)
Donora (See Monessen District)
Dubois
Adrian Furnace Co.
Dunbar
American Manganese Mfg. Co.
Earlston
Thropp, Jos. E.
Emaus (See Bethlehem District)
Emporium
Emporium Iron Co.
Erie
Perry Iron Co.
Etna (See Pittsburgh District)
Farrell (See Sharon District)
Harrisburg (See Steelton District)
Hellertown (See Bethlehem District)
Hokendauqua (See Bethlehem District)
Johnstown
Cambria Steel Co.
Josephine
McKinney Steel Co.
Kittaning
Kittaning Iron & Steel Mfg. Co.

LEBANON DISTRICT
Cornwall
Bethlehem Steel Corp'n
Lebanon
Bethlehem Steel Corp'n
Sheridan
Lavino Furnace Co.

McKeesport
National Tube Co. (Monongahela)
Neville Island
Carnegie Steel Co.
Pittsburgh
The American Steel & Wire Co. (Schoenberger)
Carnegie Steel Co. (Edith)
Carnegie Steel Co. (Lucy)
Clinton Iron & Steel Co.
Jones & Laughlin Steel Co.
Rankin
Carnegie Steel Co. (Carrie)
South Duquesne
Carnegie Steel Co. (Duquesne)
Punxsutawney
Punxsutawney Furnace Co.

READING DISTRICT
Birdsboro
Brooke (The E. & G.) Iron Co.
Leesport
Leesport Furnace Co.
Pottstown
The Eastern Steel Co.
Reading
Reading Iron Co.
Temple
Seaboard Steel & Manganese Co.
Topton
Empire Steel & Iron Co.

Saxton
Thropp, Jos. E.
Scottdale
McKinney Steel Co.

SHARON DISTRICT
Farrell
Carnegie Steel Co.
Sharon
Carnegie Steel Co.
Republic Iron & Steel Co. (Hall)
Stewart Iron Co. (Ltd.)
Sharpsville
Claire Furnace Co.
The Sharpsville Furnace Co.
The Shenango Furnace Co.
Valley Mould & Iron Co.
West Middlesex
The Ella Furnace Co.
United Iron & Steel Co. (Fannie)

Sheridan (See Lebanon District)
South Bethlehem (See Bethlehem District)
South Duquesne (See Pittsburgh District)

STEELTON DISTRICT
Harrisburg
Central Iron & Steel Co.
E. E. Marshall (Lochiel)
Steelton
Bethlehem Steel Corp'n

Swedeland
Alan Wood, Iron & Steel Co.
Temple (See Reading District)
Topton (See Reading District)
West Middlesex (See Sharon District)
Woodlawn
Jones & Laughlin Steel Co.

TENNESSEE

Johnson City
The Cranberry Furnace Co.

VIRGINIA

COVINGTON DISTRICT
Covington
The Low Moor Iron Co. of Va.
Glen Wilton
Princess Furnace Co.
Low Moor
The Low Moor Iron Co. of Va.

Glen Wilton (See Covington District)
Goshen
Southeastern Iron Co.
Graham
Pocahontas Pig Iron Corp'n

Low Moor (See Covington District)
Max Meadows
Virginia Iron, Coal & Coke Co.
Pulaski
Pulaski Iron Co.
Virginia Iron, Coal & Coke Co. (Dora)
Radford
Virginia Iron, Coal & Coke Co.
Roanoke
Old Dominion Pig Iron Corp.
Virginia Iron, Coal & Coke Co. (Crozer)
Reusens
Lavino Furnace Co.

WEST VIRGINIA

WHEELING DISTRICT
Bellaire, O.
Carnegie Steel Co.
Martins Ferry, O.
Wheeling Steel & Iron Co.
Benwood, W. Va.
National Tube Co. (Riverside)
Wheeling, W. Va.
Wheeling Steel & Iron Co. (Belmont)
Wheeling Steel & Iron Co. (Top)

WISCONSIN

Ashland
Charcoal Iron Co. of America
Mayville
The Northwestern Iron Co.
Milwaukee
Illinois Steel Co.
The Thomas Furnace Co.

CANADA

Hamilton
The Steel Co. of Canada (Ltd.)
Midland
Midland Iron & Steel Co. (Ltd.)
Parry Sound
Parry Sound Iron Co. (Ltd.)
Port Colborne
Canadian Furnace Co. (Ltd.)
Sault Ste. Marie
Algoma Steel Corp'n

NOVA SCOTIA

Sydney Mines
Nova Scotia Steel & Coal Co. (Ltd.)

Mayville Range

Madison

Milwaukee

L A K E

M I C H I G A N

Grand Rapids

Lansing

Detroit

Chicago

Indiana Harbor

Gary

Toledo

I N O I S

I N D I A N A

O H I O

Springfield

Indianapolis

Hamilton

Cincinnati

Portsmouth

Louisville

Frankfort

K E N T U C K Y

Middlesboro

REFERENCES

Shipments of Ore via all Rail Routes are in lines thus : .....

Shipments of Ore via Water and Rail are in lines thus : ——

The lines are graded according to amount of Ore shipped in the Year 1918.

NOTE:—These lines indicate shipments between given points only, and not actual routes over which ore was shipped.

The figures along the lines indicate the Tonnage in units of 100,000.

All shipments of less than 100,000 are given in decimal fractions of the unit, thus:

0.04 indicates 4,000 tons taking in all shipments from 3,500 to 4,500 tons,

0.2 indicates 20,000 tons taking in all shipments from 15,000 to 25,000 tons.

1. includes all shipments from 95,000 to 150,000 tons.

2. includes all shipments from 150,000 to 250,000 tons.

34. includes all shipments from 3,350,000 to 3,450,000 tons.

539. includes all shipments from 53,850,000 to 53,950,000 tons.

Scale of Miles

0 25 50 75 100

THE MATTHEWS-NORTHRUP WORKS, BUFFALO, N. Y.

Grand Rapids

Lansing

Point Edward

Port Colborne

Lake St. Clair

Detroit

L A K E E R I E

Erie

Conneaut

Ashtabula

Fairport

Toledo

Cleveland

Lorain

Huron

Sharpsville

Sharon

SHARON DISTRICT

Farrell

West Middlesex

YOUNGSTOWN DISTRICT

Youngstown

New Castle

Struthers

Lowellville

Leetonia

Canton

Woodlawn

Midland

Neville Island

Pittsburg

Homestead

Marshall

Bradlock

Dover

PITTSBURGH DISTRICT

Steubenville

Mingo Jct.

STEUBENVILLE DISTRICT

Duquesne

Mt. Kessport

Clairton

Monora

Monessen

Martins Ferry

Wheeling

Bellaire

Benwood

WHEELING DISTRICT

MONESSEN DISTRICT

Zanesville

Columbus

Indianapolis

New Straitsville

Hamilton

Cincinnati

Wellston

Jackson

JACKSON DISTRICT

Portsmouth

Culbertson

Hanging Rock

Ironton

IRONTON DISTRICT

Ashland

Charleston

Louisville

Frankfort

Graham

Radford

Pulaski

Max Meadows

Roanoke

Middlesboro

Johnson City

D I A N A

O H I O

W E S T V I R G I N I

K E N T U C K Y

: 1

: 1

ipped in the

its of 100,000.
nal fractions

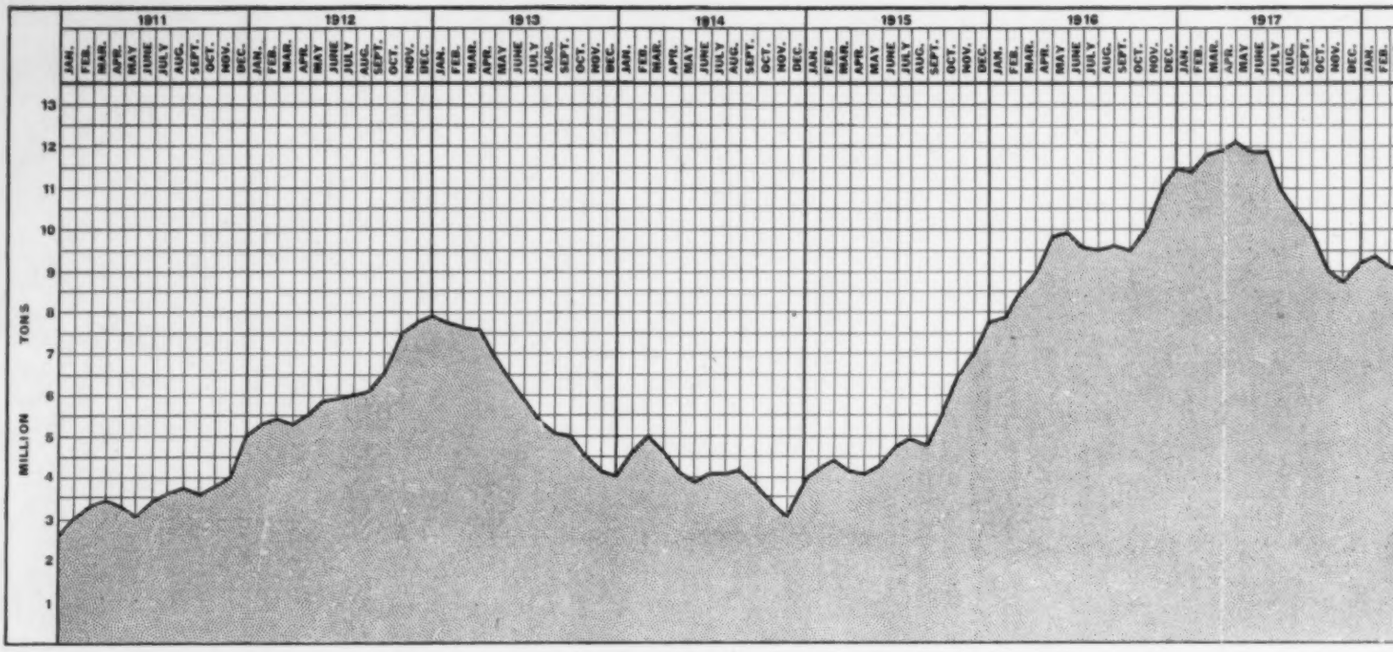
rom 3,500 to

om 15,000 to

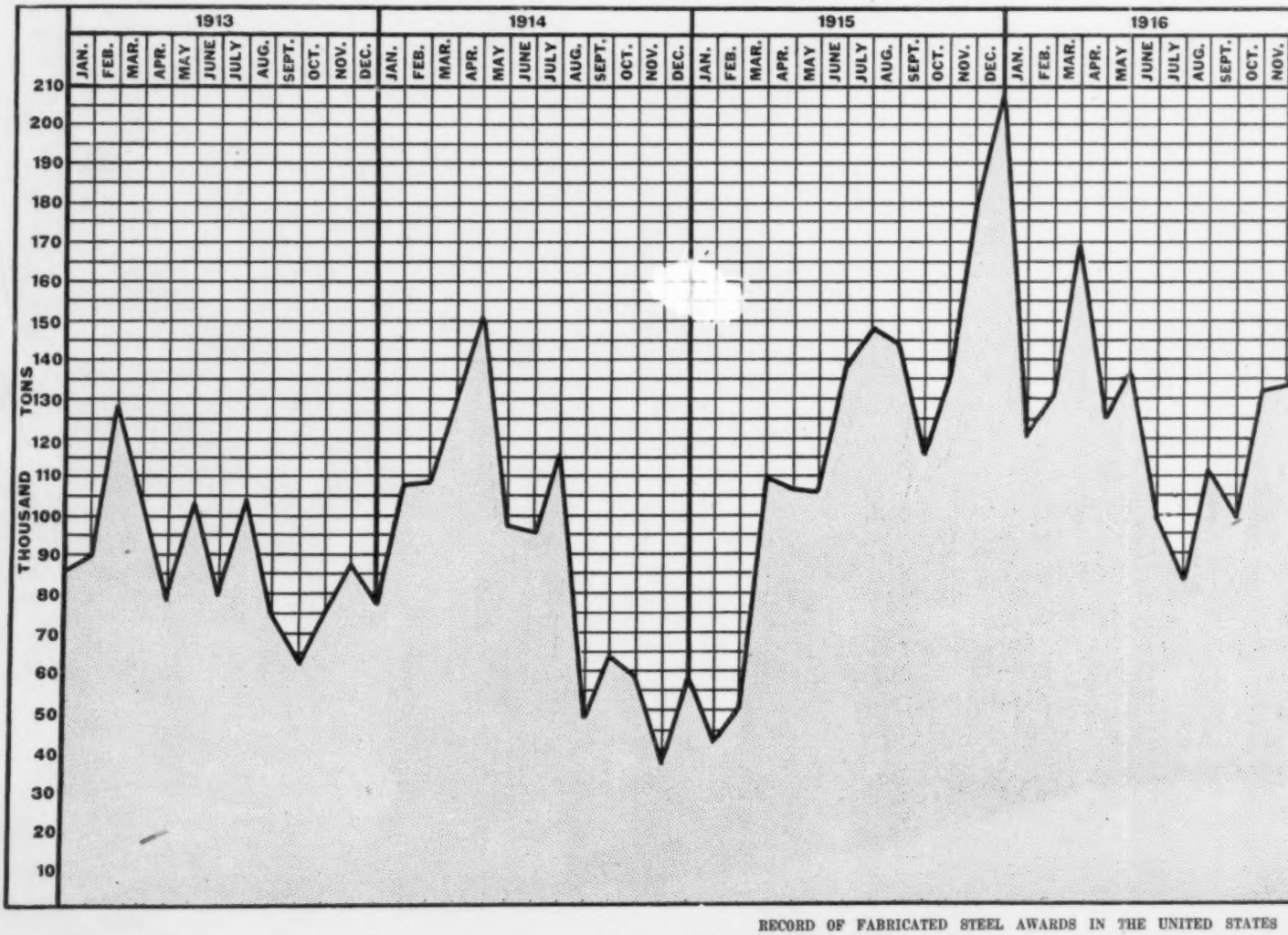
tons.
00 tons.

North Tonawanda
Port Colborne
Buffalo
47.
88.
38.
0.01
Troy
Albany
N E W Y O R K
E
rie
3.
0.1
0.3
Emporium
ARON DISTRICT
sex
Dubois
P E N N S Y L V A N I A
Punxsutawney
Stanhope
Wharton
WHARTON DISTRICT
Parryville
0.2
0.5
New York
Hokendauqua
Catasauqua
16.
BETHLEHEM DISTRICT
South Bethlehem
Hellertown
Emaus
Macungie
Allurtis
0.7
0.4
0.1
Kittanning
Pittsburgh
Homestead
Munhall
Braddock
Bessemer
Josephine
Newport
LEBANON DISTRICT
Sheridan
Lebanon
Cornwall
Temple
Reading
Birdsboro
Pottstown
NEW
Trenton
JERSEY
STEELTON DISTRICT
Harrisburg
Steelton
Duquesne
McKeesport
Clairton
Monora
Monessen
Johnstown
10.
9.
0.02
0.04
0.3
Saxton
Marietta
READING DISTRICT
Swedeland
Contesville
Philadelphia
Chester
Scottdale
Dunbar
Earlston
Atlantic City
Baltimore
MARYLAND
Annapolis
Dover
DEL.
Washington
N I A
0.02
Goshen
0.2
Covington
Low Moor
Glen Wilton
COVINGTON DISTRICT
V I R G I N I A
Richmond
Reusens
0.3
0.1
Roanoke
Norfolk
ATLANTIC OCEAN

Charts showing monthly structural awards, pr



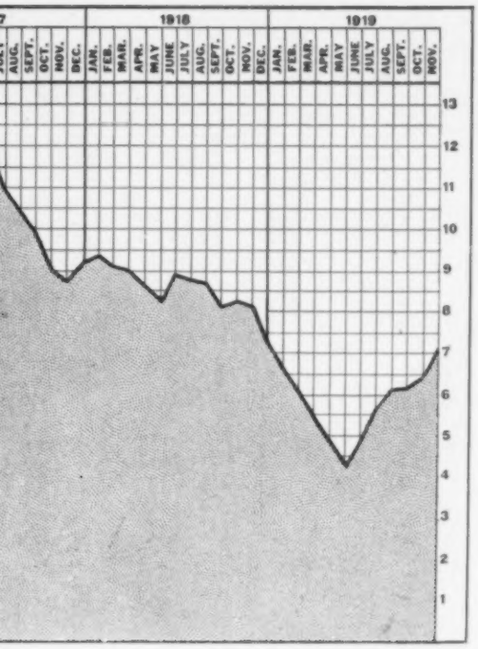
MONTHLY UNFILLED TONNAGE OF UNITED STATES STEEL CORP. 1911–1919

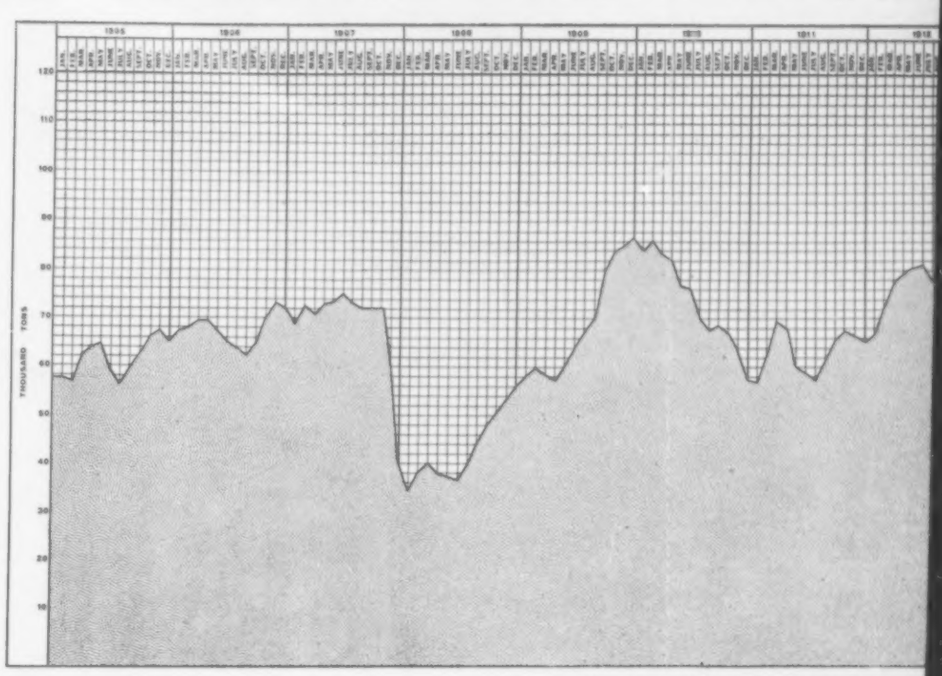


RECORD OF FABRICATED STEEL AWARDS IN THE UNITED STATES

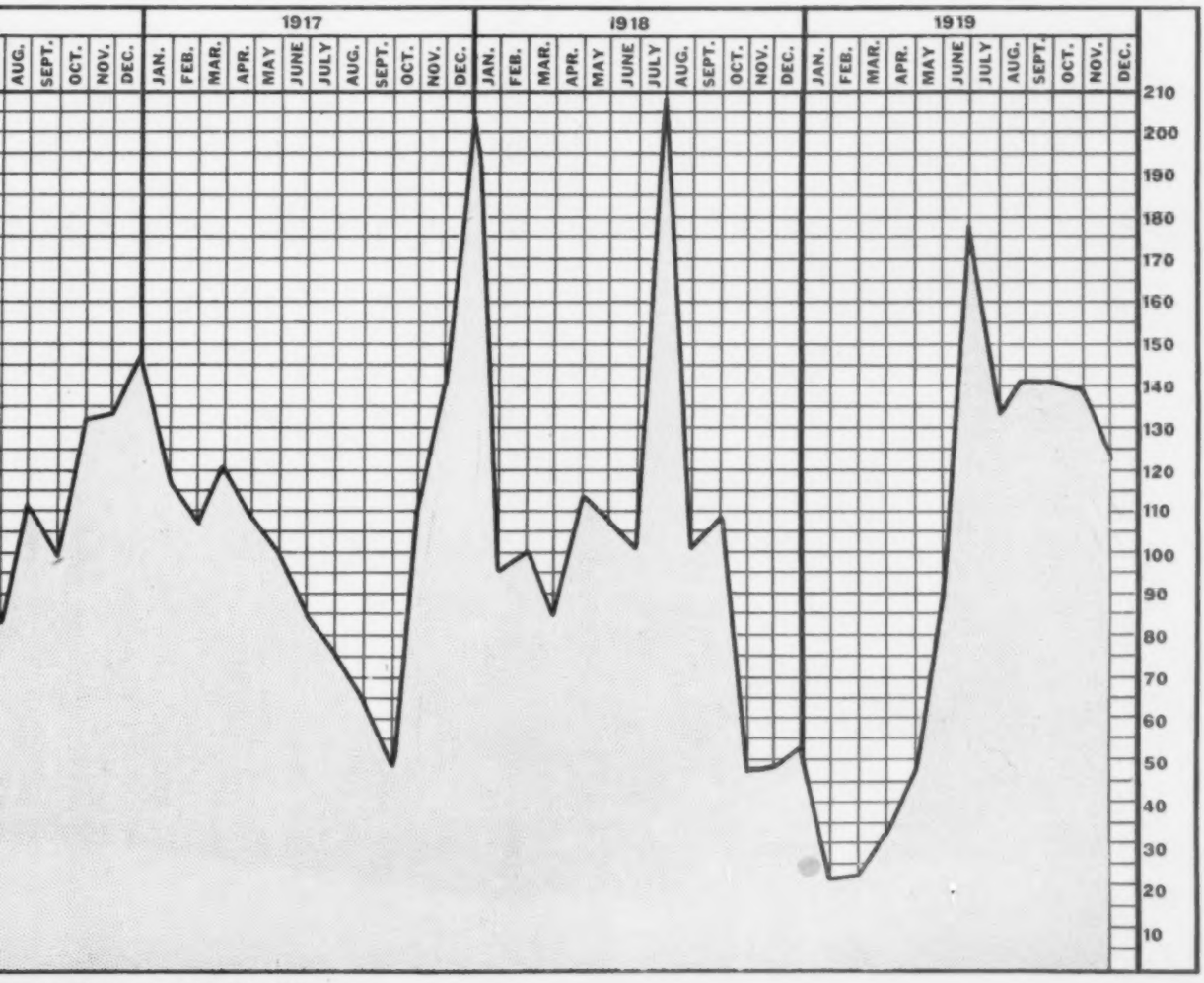
THE IRON TRADE REVIEW

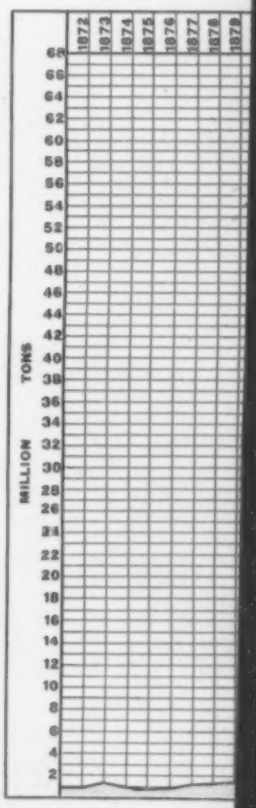
wards, production of pig iron, unfilled tonnage United States Steel Corporation, and shipments of Lake Superior i





DAILY AVERAGE PRODUCTION OF COKE

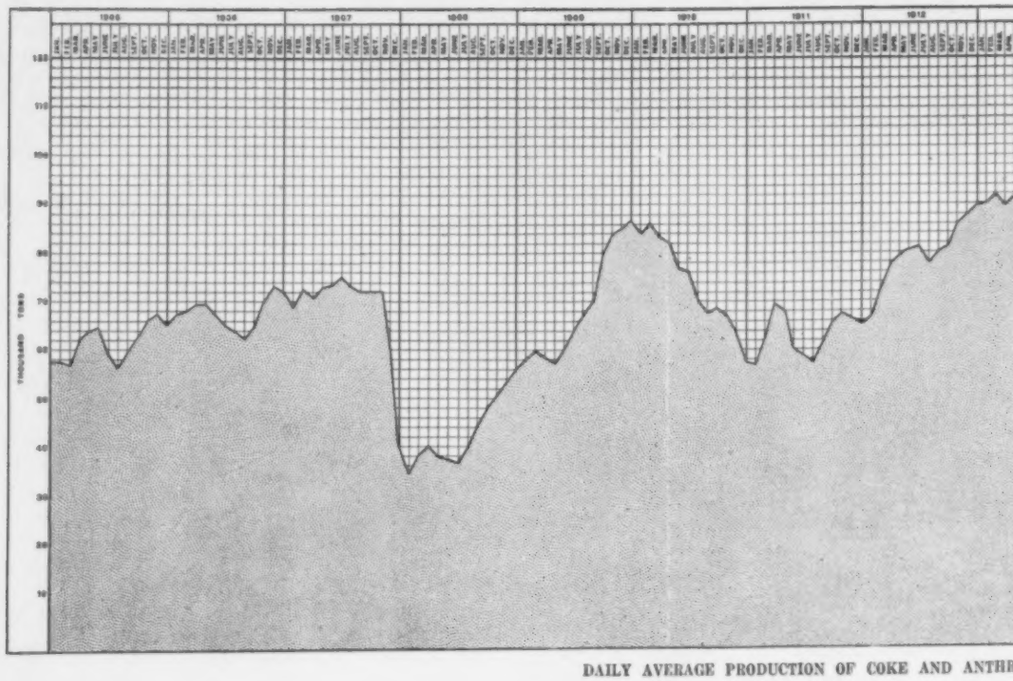




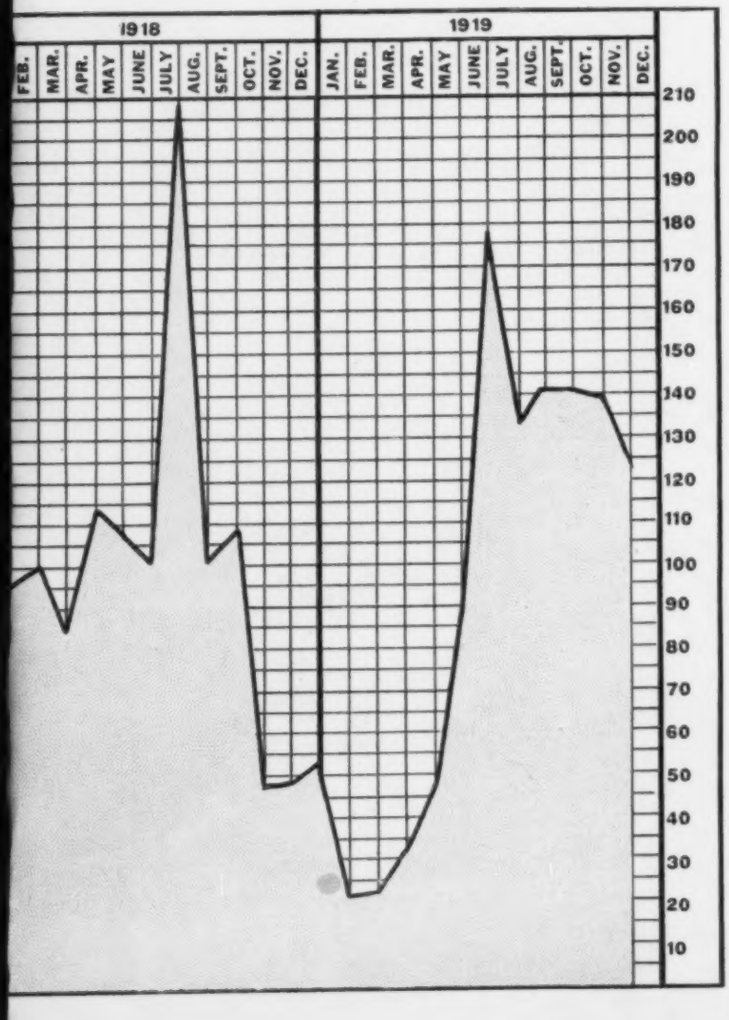
TED STATES BY MONTHS 1913–1919

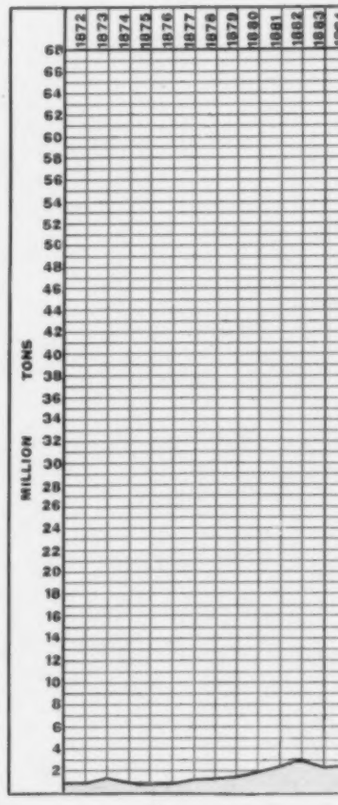
RADE REVIEW

nnage United States Steel Corporation, and shipments of Lake Superior iron or



DAILY AVERAGE PRODUCTION OF COKE AND ANTHR





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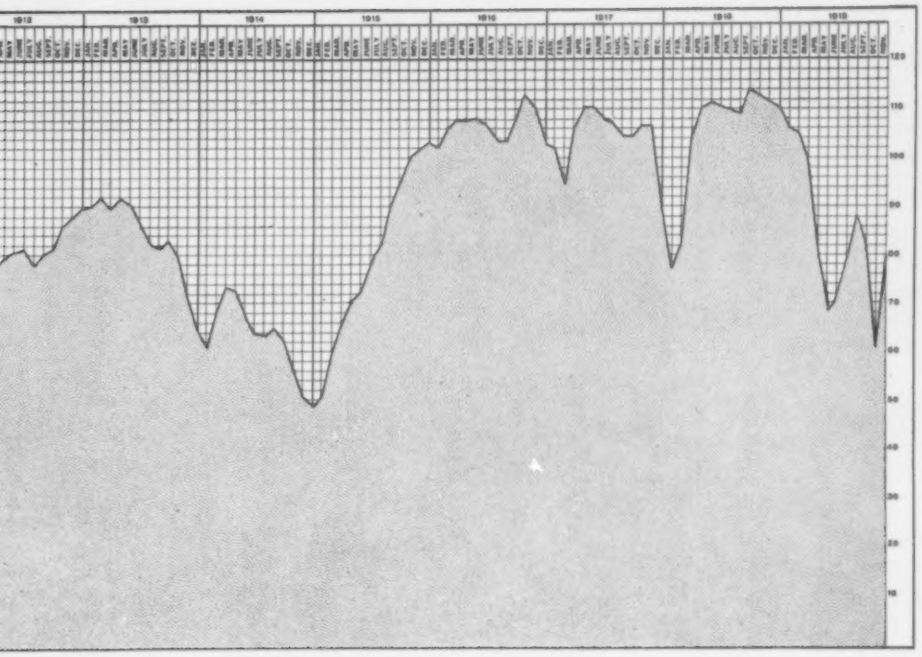
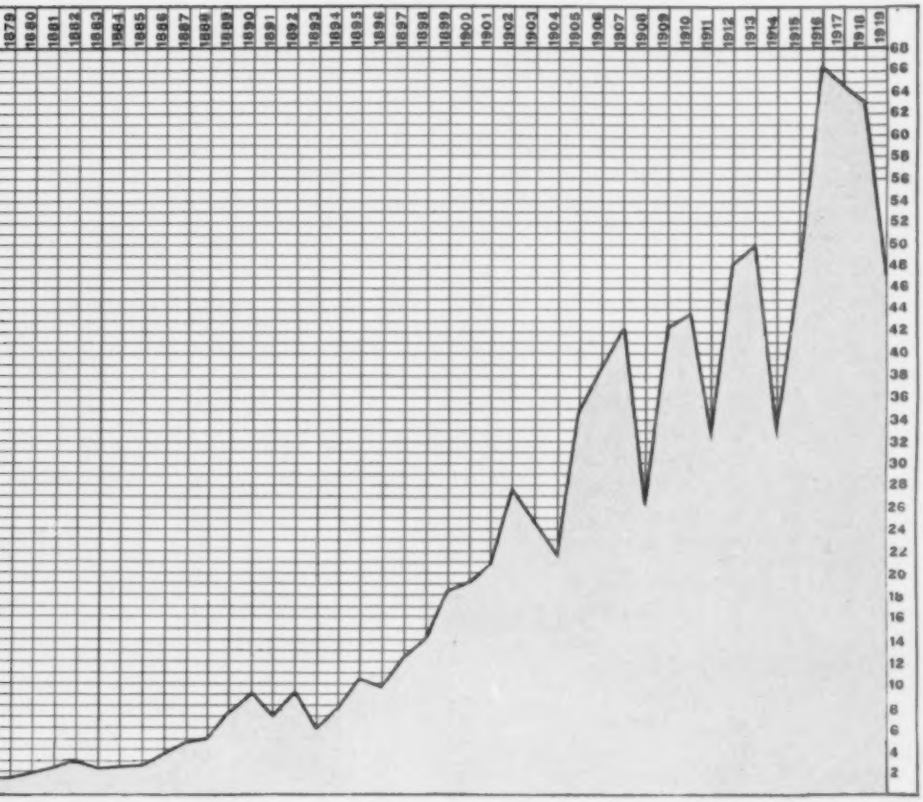
or iron ore

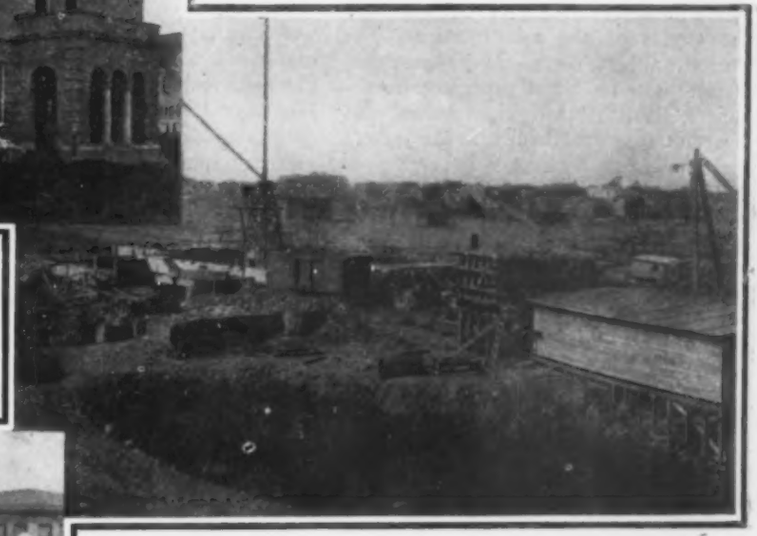


E AND ANTHRACITE PIG IRON 1905–1919



SEASON'S SHIPMENTS LAKE SUPERIOR IRON ORE 1872–1919

Moving day for Hibbing, Minn., is not without its compensations. Among the buildings erected by the Oliver Iron Mining Co., on the new site for the town is this $350,000 hospital



Buildings in this portion of the present town of Hibbing, the northerly 40 acres, are being moved two and a half miles to their new location

On this new site for Hibbing the village will have an opportunity to expand, while in its present location it is entirely surrounded by open pit mines. The village has completed a $1,000,000 power and heating system for its new home

About 85 dwellings, 12 frame business buildings and eight brick business blocks are to be moved

It will cost approximately $80,000 to move the city hall, shown below, one of the largest buildings in the village

A locomotive tractor has been hauling the buildings from the old to the new location. Here goes the village market house

building it will be necessary to set back telephone posts on one of the main streets and remove temporarily the fence and part of the grandstand of the town's baseball park. The cost of moving this building will be $80,000, an expense incurred by the Oliver company. If the village authorities eventually abandon the streets, as they must do if the 40 acres are to be mined, 40,000 yards of wood paving block laid seven years ago will be removed and laid down in the streets of the new location. The project, although presenting many obstacles, is not without precedent on the ranges, Eveleth having been moved, and Sparta transported bodily to its present location.

The generosity of the Oliver company in dealing with property owners is a matter of comment in the village, but as a little illustration of what a mining company is "up against" in attempting to move a town: A block away from the business district, and clinging perilously near the cliff of the Sellers mine there is a 2-story frame building, a "shack" it is called by some of the townfolks, occupied by a jeweler. He is one of the few "holdouts" and wants $20,000 for his lot and building.

* * *

THE opening of new plants for the beneficiation of iron ore as mined on the Mesabi range constitutes one of the most interesting developments during the past year. At present there are three methods of beneficiating ores found on the range. Certain ore deposits comprise an ore which is merchantable, but which contains a large percentage of fine sand and not infrequently a deleterious percentage of paint rock, rendering it unmerchantable as mined. The fine sand and paint rock are capable of being removed by simple washing. The machine used for this washing process is a log washer which does not differ in principle from the old Thomas log washer used for years for washing ores in Pennsylvania and certain localities in the South. Mesabi range practice has, however, greatly improved the mechanical construction of this machine in order to reduce maintenance and increase tonnage.

Certain other deposits consist of ore plus a variable percentage of rock. The ore is merchantable but the presence of the rock renders it unmerchantable, unless the rock be removed. Ordinarily the rock is of such size that screening with ordinary stationary grizzly bars answers the purpose, although an improved form of screening machine or grizzly, the chain grizzly, has been evolved in the past few years. A third type of ore deposit comprises a material which is all merchantable but which contains in addition to the reasonably fine ore, chunks of ore too large to be shipped to the furnaces. To make such a deposit merchantable it is necessary that the chunks be crushed to merchantable size and this involves the removal of the fines and then the crushing of the chunks.

In the past year the Oliver company has erected two large plants, one at Eveleth and other at the Morris mine, Hibbing. Other companies also have been active in this line, and it is now estimated that there are on the Mesabi range approximately 12 washing and screening plants. The ore tributary to the Oliver's plant at Eveleth is both wash ore and crush ore and consequently the plant really comprises two plants, the washing side and the crushing side. The washing side comprises a chain grizzly for screening out the oversize which is too large to be fed to the washer. If the oversize of the chain grizzly consists of ore in fairly large chunks this ore passes to a No. 8 gyratory crusher and then to the shipping bin. If, however, the oversize of the chain grizzly is low grade rock it is delivered to a rock bin and then conveyed to the rock dump. The throughs from the chain grizzly are conveyed by a belt conveyor to a revolving trommel with 2-inch holes and the throughs from the tunnel pass to a log washer. This log washer differs from the log washers in use at the other washing plants in that it is 35 feet long. In all the other washing plants on the range, the overflow or tails from the log washers pass to settling tanks and then to 18-inch log washers, locally known as "turbos." By increasing the length of the logs from 25 to 35 feet and giving the logs a wide and slow overflow the material which in other plants receives a secondary washing in the "turbos" is retained within the logs, thus dispensing with the second washing of the fines.

SHIPMENTS BEGAN IN AUGUST FROM THE SAGAMORE MINE ON THE CUYUNA RANGE.

The other side of the Eveleth plant is designed to handle such ores as contains large chunks, all sufficiently high grade to warrant crushing. It comprises a chain grizzly and a jaw crusher, 48 x 60-inch opening. The throughs from the chain grizzly are conveyed by a belt to the shipping bin. The chain grizzly acts also as a conveyor so that its oversize is fed directly to the crusher. The crushed ore is fed on to the same belt that conveys the throughs from the grizzly to the shipping bin.

In the Morris pit there are deposits of ore which contain low-grade rock. This pit also contains deposits of ore

much of which is in the form of large chunks. The Morris plant, therefore, is practically two plants, one for crushing, and the other for screening. The crushing plant comprises a chain grizzly, the throughs from which are discharged to a belt conveyor and conveyed to the shipping bin. The oversize, consisting of large chunks of merchantable ore are conveyed by the chain grizzly to the 48 x 60-inch jaw crusher, and the product of this crusher feeds on to the same belt and delivers in the same shipping bin.

In addition to the Oliver company's installations, the Mead Iron Co., an operating subsidiary of the Tod-Stambaugh Co., announced recently its intention to build a crushing and screening plant at the Warren mine, and the Mesaba-Cliffs Mining Co., a subsidiary of the Cleveland-Cliffs Iron Co., decided to build a washing plant at its Hill-Trumbull property near Marble, Minn. Recently a new form of concentrator made its appearance on the range, this being a machine combining a revolving screen and a classifier.

Much interest has been aroused by the development of the plans of Hayden, Stone & Co., financiers, and D. C. Jackling for the beneficiation of ore on a large scale. These interests have leased land owned by the Eastern Mesaba Iron Co., six miles east of the Mesabi station on the Duluth & Iron Range railroad and which extends in a northerly direction eight to 10 miles. Here is found a magnetite having a high iron content, but mixed with rock. In an experimental plant last year, this ore was crushed to pass through a 300-mesh screen, and it is said that a considerable tonnage of ore was treated. The plans of the promoters of the enterprise are reported to contemplate the erection of a plant to cost more than $1,000,000.

* * *

FOR many years the ore and overburden on the Mesabi range have been removed by steam shovels ranging in weight from 100 to 120 tons and carrying dippers of three to four yards capacity. In recent years, however, there was introduced on the range shovels weighing approximately 300 tons and carrying a dipper ranging from seven to eight yards capacity. These have now demonstrated their value and have come into extensive use, particularly for stripping. The smaller shovels traveled on standard gage tracks and the boom had a maximum swing of 180 degrees. The loading tracks were on approximately the same level as the track on which the shovel traveled and the length of the boom was such that the depth of the bank in which the shovel operated was limited to approximately 30 feet.

The new type of shovel is capable of revolving in a complete circle and the length of the boom is 85 or 90 feet, making it possible for the loading tracks to be on the top of the cut so that the bank in which the shovel is working may be 40 or 45 feet high. The shovel is capable of making a cut of 175 feet at the top and 130 feet at the bottom. If a cut of this size were to be made by the former type of shovel it would require the laying of standard gage tracks about eight times, according to the experience of those who have used both types. One important economy in connection with the operation of the big shovel, therefore, comes largely in the saving of labor in laying tracks.

Increased cost and scarcity of common labor emphasizes the fact that an improved method of loading ore underground must come if the production of ore is to keep pace with other industrial lines where machinery has eliminated hand labor. A great many attempts have been made recently to build a loading machine for use underground. In the coal fields greater activity has been shown along this line than in metal mines, but the metal mine operators are alive to the subject.

Excellent results are reported from some mines as being obtained by the use of ordinary road scrapers or slushers, as they are called, the ore being moved underground just as dirt is moved on the surface. Underground, however, the scraper is not pulled by a team of mules, but by a specially constructed machine which can readily be attached to a set, cap, or drill column and which will run in any position by compressed air. Some operators say it is probably the simplest form of mechanical loading underground which is in use.

Extensive developments have been made during the past year in the application of hydroelectric power in mining operations in the upper peninsula of Michigan and these will be described in a later issue of THE IRON TRADE REVIEW.

THE SAGAMORE IS ONE OF THE LARGEST MANGANIFEROUS ORE BODIES IN THE WORLD

* * *

THE new ore dock of the Duluth, Missabe & Northern railroad, which was put in commission last year and which cost $3,500,000, is the largest in the world. It has a storage capacity of 153,600 tons, while the Soo line dock at Superior which previously was rated as the largest has a capacity of but 120,600 tons. The new dock is 2438 feet long, sufficiently long to accomodate on either side two of the world's largest ships, the BISMARCK and the

LEVIATHAN, lying end to end. The dock is 76 feet 5 inches wide and 84 feet above water, while the electric light masts reach 120 feet above water. In the construction of the dock 29,609 tons of steel were used, an amount which would require approximately 60,000 tons of iron ore. The ore tonnage could be placed in less than one-half of the dock and loaded into boats in less than 30 minutes. Some of other large quantities of materials used in its construction are as follows: 1,067,971 lineal feet of timber piling, 50 to 85 feet in length; 174,230 lineal feet of 12-inch, 43-pound steel sheet piling; 162,570 square of triangular mesh, and 59,846 cubic yards of concrete, in dock and approach. The superstructure of the dock has 84 ore pockets, 12-foot centers, with 6540 cubic feet capacity each. Eight standard 50-ton ore cars can be dumped into each pocket without trimming, thus providing a storage capacity of 3072 cars. The top of the dock carries four tracks, and the entire dock and approach were designed for use by the heaviest locomotives of the Duluth, Missabe & Northern railway, the 304-ton Mallet type engines and the 266-ton Santa Fe type with 55,000-pound axle loads. The superstructure is a structural steel frame with concrete partitions, pocket walls and sidewalk slabs. The fronts are of plate steel reinforced with heavy I-beams and tie bolts. The whole is supported by two lines of steel I-beam columns spaced 12 feet apart, each column being designed to carry 1,500,000 pounds.

The ore chutes are of the usual type but heavier and are raised and lowered by specially designed hoists of the Whiting Foundry & Equipment Co. These hoists are driven through clutches by power from a line shaft gear connected to General Electric alternating current motors, one motor operating 12 spouts and doors. The ore pocket doors are of the Dickerson type made of steel plates and frame with two lifting cables wound on drums built into the chute hoists. This makes it possible to raise and lower the doors by power from the deck of the dock.

* * *

AS regards to the more important operations and development work on Michigan and Minnesota ranges:

THE SCRANTON MINE OF PICKANDS, MATHER & CO., HAS AN OVERBURDEN OF 130 FEET.

The Hoyt Mining Co., an operating subsidiary of Pickands, Mather & Co., is stripping about 80 acres of the Scranton mine at Hibbing. This mine was operated originally as an underground property, but while stripping was started in the fall of 1917 and more than 3,300,000 cubic yards of overburden removed, it is not expected that ore will be reached until next spring. Some shipments may be made during the ensuing season. The average depth of the overburden at the mine is 130 feet, which is said to be the deepest of any pit on the Mesabi. Pickands, Mather & Co.'s Danube mine, an open pit on the the west end of the Mesabi started shipping for the first time during the past season. A washing plant was erected and 225,000 tons of concentrates were shipped. Both bessemer and non-bessemer ore will be shipped from this mine in future. It is estimated that the pit contains between 4,500,000 and 5,000,000 tons of ore.

The Pittsburgh Steel Ore Co., operating the Rowe mine on the Cuyuna range ceased work in the open pit, offering its washing plant for sale, and during the past season mined a direct-shipping ore by the milling method.

Pickands, Mather & Co., who had taken over the Plymouth mine on the Gogebic range from Coates & Tweed mined about 500,000 tons of ore during the past season. Prior to 1919 this mine shipped approximately 1,800,000 tons of ore. The new owners are now completing a stripping operation, and when this is finished a total of 4,000,000 cubic yards of surface and 3,500,000 cubic yards of rock will have been removed since the development of the mine began in 1916.

The Cleveland-Cliffs Iron Co., is to begin soon to strip the Bourne mine, which, with the Trumbull, North Star, Bingham and Hill mines, it took over last summer from the Great Northern interests.

The Harold mine, an underground property at Hibbing was opened up last season by M. A. Hanna & Co. This company also put down a shaft at the Fay mine, which previously was operated as an open pit. Both of these mines were taken over from the Arthur Iron Mining Co. A new shaft also was put down and new equipment installed at M. A. Hanna & Co.'s mine at Hobart, Minn., while the Pilot, an open pit at Mountain Iron, Minn., was opened up for the first time during the past season by this company, which also opened up

the old Monongahela mine at Crystal Falls on the Menominee range.

The Tod-Stambaugh Co., began shipping from its Billings property on the Mesabi, while the Wisconsin Steel Co., started operations at the Sargent mine. Clement K. Quinn & Co., are planning to open an open-pit concentrating property in Section 2-56-23 on the Mesabi this winter. At the Draper mine at Calumet on the western Mesabi, a small open pit operated by John A. Savage & Co., a washing plant was completed early last season and bessemer ore was shipped. The lease on the Zenith mine on the Vermilion range held by the Oliver company expired last July and this property was taken over at that time and operated by the fee owners.

Shipments from the Cuyuna range during the season just closed amounted to 1,805,751 tons as compared with 2,478,800 in the previous season. The decrease was due largely to the closing of about 75 per cent of the manganiferous mines which were operated during the latter period of the war. The state tax commission recently made a substantial concession on the manganiferous properties, while extensive experiments have been made in beneficiation of ores as mined on the range, with the result that the operators have a brighter outlook. It is reported that the operators of about 40 per cent of those mines which were closed down last year are planning to resume operations in 1920. Among the mines which were shut down were the Algoma, the Crow Wing A, B and C, the Ferro, Merritt, Cuyuna-Sultana, Northland and the Cuyuna Mille-Lacs. The Ida Mae was practically closed during the season, having shipped only from stockpile. This mine was operated in 1918 by Franklin W. Merritt, but his interests were purchased by W. H. Fetzer, who plans to reopen the mine in 1920.

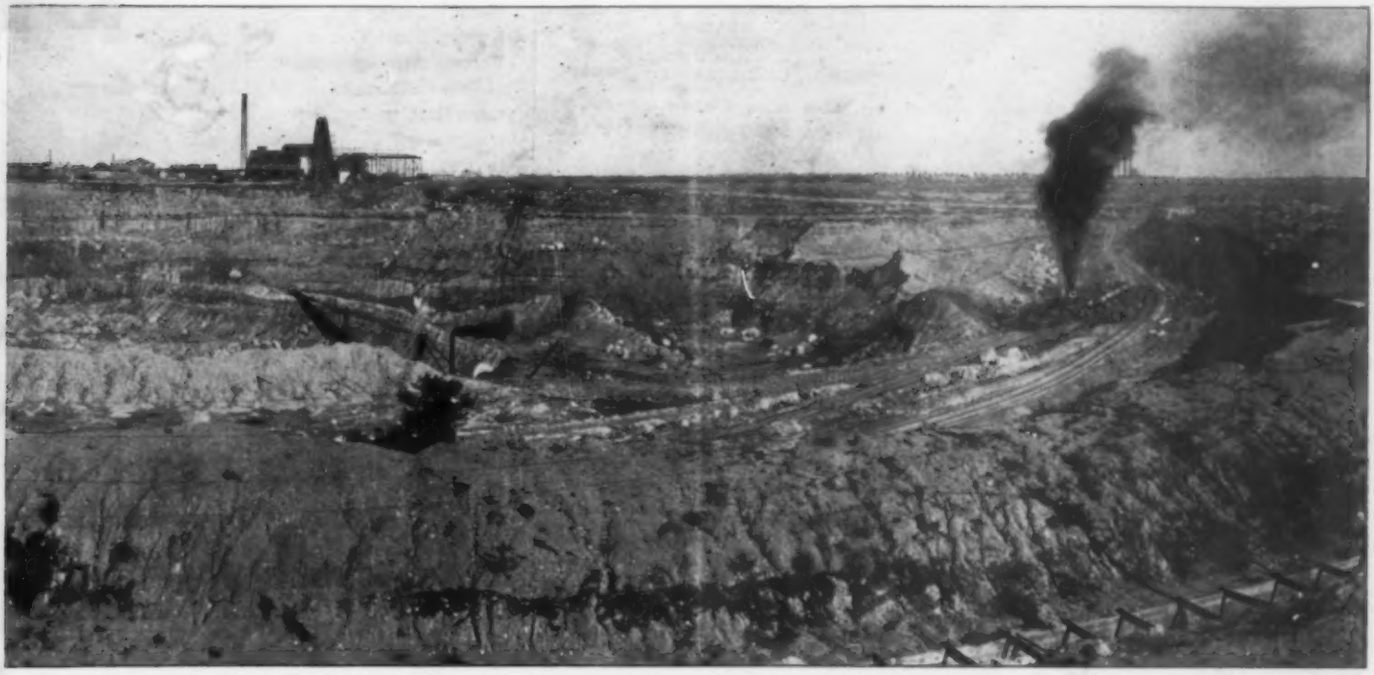
The large manganiferous deposit in Section 19-46-29, six miles west of Crosby was leased by John A. Savage & Co., in 1918, and in March, 1919 stripping was commenced with drag line shovel, a second drag line being started in June. Shipments began in August, and while the tonnage contracted for was curtailed by the inability of eastern furnaces to accept ore on account of the strike about 85,000 tons were shipped. This mine, the Sagamore, is of special interest because it is a large body, one of the largest manganiferous ore deposits in the world. The ultimate open-pit project will be one mile from end to end. The ore is a nonbessemer grade, the entire ore body averaging over 10 per cent in manganese. By separation, this ore can be divided into manganiferous ores running from 6 per cent to 20 per cent. It is planned this winter to erect a large ore drying plant to reduce the moisture as much as possible without damaging the physical condition of the ore.

At the Croft mine, an underground property at Crosby, operated by John A. Savage & Co., the main level was lowered from the 222-foot stage to the 323-foot and pumping and tramming equipment is now being installed on the new level.

On the Cuyuna range, George H. Crosby developed the Huntington and Martin mines, underground properties a mile west of Crosby. He equipped them with electricity, using hydroelectric power from the Crow Wing river, just north of Brainerd, but also installed an auxiliary oil-burning engine.

Stripping operations were begun at the Portsmouth mine within four blocks of the principal street of Crosby and 1,000,000 cubic yards of overburden removed. This mine is operated by Coates & Tweed, the underlying lease being held by Mr. Crosby. It opens into the Wearne mine, opened up by the Inland Steel Co., from which mine about 100,000 tons of ore were taken during the past season. The Rogers, Brown Ore Co., is sinking its shafts 100 feet further to a depth of 350 feet at the Meacham mine on the Cuyuna, while the Inland Steel Co., also is deepening its shafts at the Armour No. 2. The Hillcrest mine which was owned and operated by the Hill Mines Co., has been taken over by Coates & Tweed.

One of the largest deals ever made in the Cuyuna range was put through this past season by R. M. Adams and associates in developing a property in section 4-46-29 adjoining the town of Trommald. The property was thoroughly explored and developed by the Adbar Development Co. for the holding company, the North Rrange Iron Co., formed by the owners, which in turn leased the property to the Marquette Ore Co. The lessees have installed equipment on the premises and will proceed to strip the property hydraulically. Some of the ore from



ORIGINALLY AN UNDERGROUND MINE, SHIPMENTS FROM OPEN PIT ARE EXPECTED TO BEGIN IN THE SPRING

Table III

Minnesota Ore Reserves and Assessed Values

County	May 1, 1918, Ore in the Ground Tons	Assessed value	May 1, 1919, Ore in the Ground Tons	Assessed value
St. Louis	1,211,778,954	$267,103,630	1,180,822,166	$257,791,519
Itasca	156,267,383	19,379,842	155,195,645	18,734,720
Lake	150,000	39,900	77,000	19,950
Crow Wing	62,514,960	7,078,768	58,828,640	4,073,558
Totals	1,430,711,297	$293,602,140	1,394,923,451	$280,619,747

County	In Stock Pile Tons	Assessed value	In Stock Pile Tons	Assessed value
St. Louis	5,911,051	$7,001,305	3,978,380	$5,824,794
Itasca	401,820	499,247	340,110	430,633
Lake	19,288	28,722	29,110	51,093
Crow Wing	693,628	708,312	564,803	520,899
Totals	7,025,787	$8,237,586	4,912,403	$6,827,419

County	Total Merchantable Ore Total in Iron Ore Tons	Assessed value	Total Merchantable Ore Total in Iron Ore Tons	Assessed value
St. Louis	1,217,690,005	$274,104,935	1,184,800,546	$263,616,313
Itasca	156,669,203	19,879,089	155,535,755	19,165,353
Lake	169,288	68,622	106,110	71,043
Crow Wing	63,208,588	7,787,080	59,393,443	4,594,457
Grand totals	1,437,737,084	$301,839,726	1,399,835,854	$287,447,166

The assessments given above do not include assessments for surface values, structures or improvements.

this property may be mixed with some of their ores from the Marquette range where this company, though to date not an operating company owns, the fee to properties operated by the Marquette Iron Co. Part of the ore found on the Cuyuna property is merchantable and part will have to be washed. It is not a manganiferous ore while tests have indicated that it is the equal of standard nonbessemer.

Operations on the Marquette

On the Marquette range, the Cleveland-Cliffs Iron Co., operating most of the properties on the range, took over the Barnes-Hecker mine in the North Lake district, a part of the Ishpeming district, and is sinking a concrete shaft. The Oliver Iron Mining Co., which owns in fee about a half dozen mines on this range is operating but one, in Section 16, while concentrating its activities on its Mesabi properties.

The Rolling Mill mine in Negaunee, formerly under lease to the Jones & Laughlin Ore Co., recently was taken over by Clement K. Quinn & Co. This mine has been operated both as an underground and an open pit. The mine produced 125,000 tons last year and is now operating on a basis of 250,000 tons. The Jones & Laughlin company is not operating any property in Michigan at present, it is understood, but has made extensive explorations on the eastern Gogebic and is waiting to obtain a railroad connection with prospects of opening a property. It owns the Forbes mine near Iron River, but this is idle.

The Stephenson mine, a big property at Gwinn on the Marquette, owned by the Cleveland-Cliffs Iron Co., was flooded by a run of water in December, 1917, and has not been freed of water as yet.

On the Menominee range, one of the most important of recent events was the passing of the big Judson mine of the Judson Iron Co., at Alpha into the hands of the Hollister Mining Co., operating properties of M. A. Hanna & Co. The Judson was idle most of last season but will be operated this spring. The Chatham of Oglebay, Norton & Co.; Spies, of the Cleveland-Cliffs; Dunn, Tully and Tobin, of the McKinney Steel Co., and the Baltic, of the Verona Mining Co., operating properties of the Pickands, Mather & Co., shut down last season, but the Dunn recently was started up again, while it is planned to start the Tully and Tobin early this year. The Odgers, owned by the McKinney Steel Co., which was shut down prior to the season of 1918 also reopened recently, a new shaft having been sunk at this mine. The Great Western, another property of the McKinney company, and the Fogarty, of the Verona company, remained idle during the season while the Bristol, of Oglebay, Norton & Co., operated with but a few men.

The Carpenter mine, one of M. A. Hanna & Co.'s properties, produced 390,000 tons of ore last season, as compared with 384,000 tons in 1918, a large cavein of sand requiring two months to remove and delaying operations.

The Rogers-Brown Iron Co., operating the Hiawatha, Rogers and Chicagon in Iron county, and an open pit near Monroe, Mich., was not able to dispose of its stockpile, owing to the strike of dock workers and worked on single shift.

Pickands, Mather & Co.'s properties, the Balkan, Bengal, Caspian and Warner mines produced 10 per cent less ore during the past year than in 1918.

Table V

Shipments by Ports and Railroads

Gross Tons

	1919	1918
C. & N. W., Escanaba	3,410,005	4,737,689
C. M. & St. P., Escanaba	1,553,353	2,037,289
D. S. S. & A., Marquette	634,087	826,948
L. S. & I., Marquette	1,498,848	2,630,106
C. & N. W., Ashland	4,866,240	6,389,169
Soo Line, Ashland	1,049,143	1,176,439
G. N., Superior	9,114,214	11,635,603
Soo Line, Superior	1,263,503	1,756,265
N. P., Superior	542,248	676,473
D. M. & N., Duluth	16,821,209	20,567,288
D. & I. R., Two Harbors	6,424,545	8,723,472
Totals	47,177,395	61,156,732

Table IV

Shipments by Ports and Months

1919

Month	Escanaba	Marquette	Ashland	Superior	Duluth	Two Harbors
April	71,417	147,358	.....	101,730	794,050	297,684
May	583,463	151,749	669,647	1,280,536	2,957,338	1,002,608
June	759,647	296,127	951,287	1,889,294	2,947,651	1,136,833
July	1,007,035	443,850	1,176,553	2,241,907	3,122,098	1,178,985
August	336,334	277,943	375,243	872,335	1,645,788	847,944
September	939,099	431,995	1,190,086	2,033,804	2,591,750	991,749
October	756,926	820,222	878,031	1,830,472	1,886,951	569,281
November	483,046	251,149	527,176	615,903	875,584	399,461
December	26,390	.....	.....	.....	20,272	.....

1918

Month	Escanaba	Marquette	Ashland	Superior	Duluth	Two Harbors
April	.....	10,708	.....	99,562	56,991	68,609
May	655,495	495,043	898,147	2,088,029	3,055,083	1,600,434
June	1,077,871	547,927	1,137,921	2,510,974	3,164,296	1,482,871
July	1,109,511	630,341	1,337,047	2,352,679	3,636,948	1,592,677
August	1,168,604	592,073	1,209,394	2,146,689	3,243,806	1,364,765
September	1,025,741	536,886	1,096,686	1,978,984	3,204,829	1,151,888
October	1,015,089	437,229	1,255,176	1,887,284	2,920,070	1,026,745
November	715,822	206,847	631,237	1,004,140	1,285,496	435,483
December	6,830	.....	.....	.....	.....	.....

Ferroalloy Industry Meets Test

Critical Period For Greatly Expanded American Production Following the Armistice is Survived Without Serious Embarrassment—Future is Promising — Growing Manufacture of Alloy Steels is Big

BY G. F. CREVELING

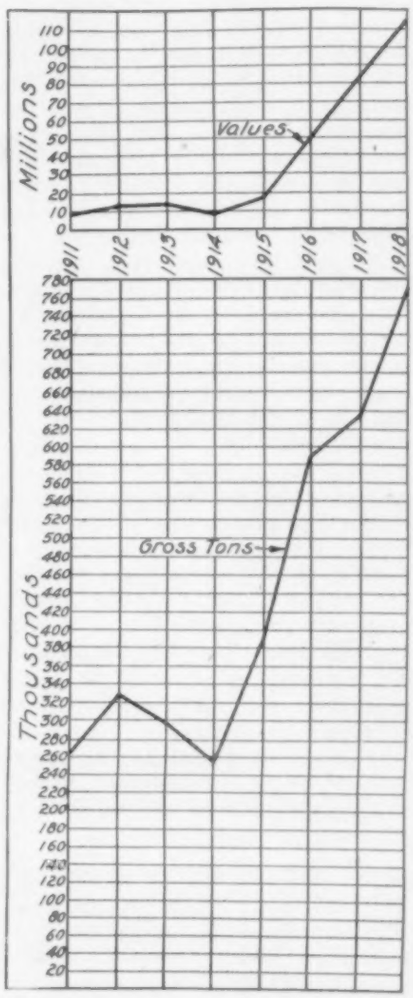
WHAT of the future of the American ferroalloy industries? In the year that has passed since the signing of the armistice, the ferroalloy industries have been put to the severe test of readjustment to peace conditions. It has been clearly demonstrated, however, that this branch of the iron and steel industry not only is here to stay, but also is destined constantly to increase in importance. This is true not only of the standard ferroalloys used as deoxiders and scavengers, but also of the specialties entering into the manufacture of alloy steel. The sword has been turned into a plowshare, but the world has learned that the sword fashioned from alloy steel is superior to the one made from ordinary steel. And now that the world is again making plowshares, it is not forgetting the industrial lessons learned in the heat of war.

Ferroalloys were made in this country before the war, but their production was wonderfully stimulated and expanded by the various military demands for high grade and special steels. Shell steel, armor plate, artillery tanks, airplanes, helmets and scores of other items of military equipment were prdouced in vast amounts, in the manufacture of which ferroalloys imparting particularly needed qualities were required. When the armistice was signed, more than a million tons of shell steel were in process of manufacture, a continual flow from the mills to the front. This tremendous tonnage required both ferromanganese and ferrosilicon in its production, while ferrotungsten and other alloys were needed in the high speed steels which machined it into shells.

The following table, showing annual shipments and values of ferroalloys of domestic manufacture indicates the growth in importance of the ferroalloy industries during the five war years:

	Gross Tons	Value
1911	253,375	$ 8,377,832
1912	328,685	12,223,776
1913	296,207	13,015,362
1914	255,524	9,350,245
1915	388,644	17,450,385
1916	589,738	50,281,692
1917	634,021	83,731,724
1918	768,617	115,433,943

The end of hostilities suddenly removed the demand for munitions, at a time when the nation's ferroalloy industries had reached their highest development.



HOW OUTPUT AND VALUE OF FERROALLOYS HAS GROWN SINCE 1911

Then those industries faced the momentous problems of readjustment to peace conditions. These problems were pressing to commerce and industry generally, but particularly so to the ferroalloy industries, which owed so much of their growth to the war. Large stocks of most of the alloys necessarily were being carried by the steel makers and were available for the less urgent peacetime needs, with the result that buying demand was abnormally slow during most of the year in a period of declining prices.

England and France likewise were engaged in a drastic readjustment to peace conditions and because of international financial conditions were doubly anxious to regain supremacy in fields dominated before the war. Competition was revived after five years of a sellers' market. In ferromanganese, ferrochrome and ferrotungsten, especially, competition was experienced with English and French sellers. Bills were introduced in congress proposing tariffs on imports of these three alloys. In the cases of ferrochrome and ferrotungsten, the bills were introduced at the behest of domestic producers of ores used in these alloys, who suffered in competition with sellers of foreign ores.

While the ferroalloy industries have thus far been spoken of collectively, the conditions confronting each industry differ and each must be treated separately. In 1918, the total tonnage of ferroalloys produced was 817,446 tons, of a value of $115,433,943. This output in 1918 was classified by general groups of alloys in gross tons as follows:

	Tons	Value
Ferromanganese	303,027	$ 69,045,678
Spiegeleisen	303,491	17,276,494
Ferrosilicon	171,756	11,864,904
Other alloys	*9,172	17,246,867
Total	817,446	$115,433,943

*Incomplete.

From the foregoing table it will be noted that the output of ferromanganese comprised about 40 per cent in tonnage and 60 per cent in value of the total ferroalloys produced in 1918. The following table shows in gross tons the annual production, imports and total supplies of ferromanganese in the past several years.

	Production	Add imports	Total supplies
1909	82,209	88,934	171,143
1910	71,376	114,278	185,654
1911	74,482	80,263	154,745
1912	125,378	99,137	224,515
1913	119,495	128,070	247,565
1914	106,083	82,997	189,080
1915	149,521	55,263	204,784
1916	221,532	90,928	312,460
1917	260,125	41,969	299,694
1918	333,027	26,906	356,356
1919*	129,356	16,994	146,350

*First 8 months of 1919.

The foregoing table, showing total new supplies of ferromanganese the first eight months of the year as 146,350 tons, against total new supplies of 356,356 tons in all of 1918, will indicate in a general way that the statistical position of the alloy has greatly improved.

The detailed record of this year's production will afford additional proof of this belief. The following table classifies production of ferromanganese by mer-

chant and steelmaking blast furnaces and excludes that made in electric furnaces during all of 1918 and the first 10 months of 1919.

	1918 Gross tons	First 10 months 1919 Gross tons
Merchant stacks	166,168	42,868
Steelmaking stacks	144,947	94,739
Merchant and steelmaking stacks	12,714	13,034
Total	323,829	150,641

Merchant Output Declines

One of the most significant features of the table on the division of output made or not made for the market is the reduction in strictly merchant production of ferromanganese. In 1918, 166,168 tons were produced for sale. In the first 10 months of 1919, only 42,868 tons were made for the market, a reduction of about 90,000 tons from the tonnage of 132,000 produced by merchant furnaces the first 10 months of 1918. The production by steelmakers amounted to 94,739 tons the first 10 months of 1919, a decline of 30,689 tons from the total of 125,423 tons made during the first 10 months of 1918.

Consumers of ferromanganese however, had available large stocks at the beginning of 1919. These stocks were estimated at 100,000 tons of alloy containing 70 per cent or more of manganese as of Nov. 1, 1918 and probably did not change perceptibly during the last two months of 1918. Accordingly, 1919 supplies have been about as follows, including stocks, imports and output:

Stock Jan. 1	100,000 tons
Imports first 8 months	16,994
Production first 10 months	150,641
Total	267,635 tons

Ferro Imports Are Small

On the basis of the eight months' showing, total imports of ferromanganese in 1919 may be estimated roughly at 25,000 tons. And similarly, on the basis of the first 10 months' showing, output for the whole year may be estimated roughly at 175,000 tons. At this rate, total supplies for the year would amount to something like 300,000 tons. Consumption, of course, is determined by the general condition of the steel industry, which suffered considerably during the year from labor troubles. In the five years before the war, ferromanganese consumption averaged about 200,000 tons annually, but exceeded 300,000 tons yearly in wartime. The total production of steel ingots and castings during the five-year prewar period averaged 27,255,000 tons annually, of which about 18,000,000 tons were openhearth. During the first eight months of 1919 the production of steel ingots as reported to the American Iron and Steel institute was 20,117,000 tons, by makers representing 84 per cent of the country's capacity. On this basis production of steel in 1919 may be estimated at 28,000,000 to 32,000,000, depending upon the extent of curtailment caused by the steel strike, which would mean the consumption of considerably more of the alloy than in the five prewar years. With better operating conditions in 1920, steel output should approach 40,000,000 tons, for the world demand for steel cannot be denied. In this connection, it may be remarked that the proportion of open-hearth steel has been on the increase. This means more ferromanganese will be used and more must be made. It is a fact that stocks of alloy in the hands of merchant and nonmerchant furnaces available for sale as the year 1919 closed were negligible, excepting for some off-grade material. Also, the trend of the times in steel practice seems to have been from spiegeleisen toward ferromanganese. Many consumers who used spiegeleisen during the war, at the request of the war industries board, to conserve ferromanganese now are using the latter, metal supplies being more available. In addition to the 356,356 tons of ferromanganese available for consumption in 1918, supplies of spiegeleisen amounted to 285,822 tons. In 1919, new supplies of spiegeleisen, as shown later, declined to 74,986 tons. Therefore, in considering the statistical position of ferromanganese, the decreased supply of spiegeleisen is an important factor. In this calculation, it will be remembered that one ton of ferromanganese replaces four of spiegeleisen on the basis of 80 units of manganese in the former and 20 units in the latter material. Another phase of the question is the constantly reduced output of bessemer steel in this country which was further extended during 1919. With the war pressure which called for every ton of manganese alloy, now a thing of the past, the demand for spiegeleisen now is taking on its normal proportions for the production of bessemer steel and this means a sharp reduction from the tonnages called for in 1916, 1917 and 1918.

The war brought in a big electric furnace production of ferromanganese, which contributed to the large outputs of 1917 and 1918. But these interests could not afford to pay power and other costs and sell their product at anything like the current market. This new capacity was caused by the excited market for the alloy. Before the war, 80 per cent ferromanganese sold at $38 to $45 a ton, whereas in May, June and July, 1917, 80 per cent ferromanganese sold up to $400 a ton. In the first eight months of 1918, under government control of the iron and steel industry, the quotation for ferromanganese was $250 a ton, delivered. During the months of January to May 16, inclusive, this price applied to 80 per cent alloy and in the following months of the year to 70 per cent, the standard having been changed at the request of the government. In December, 1918, after the armistice, the price dropped to $200 a ton; thenceforth the decline was rapid, late summer of 1919 seeing a market of $110 delivered for 80 per cent domestic alloy.

Import offerings of British alloy assisted the decline, the British makers being anxious to regain the American

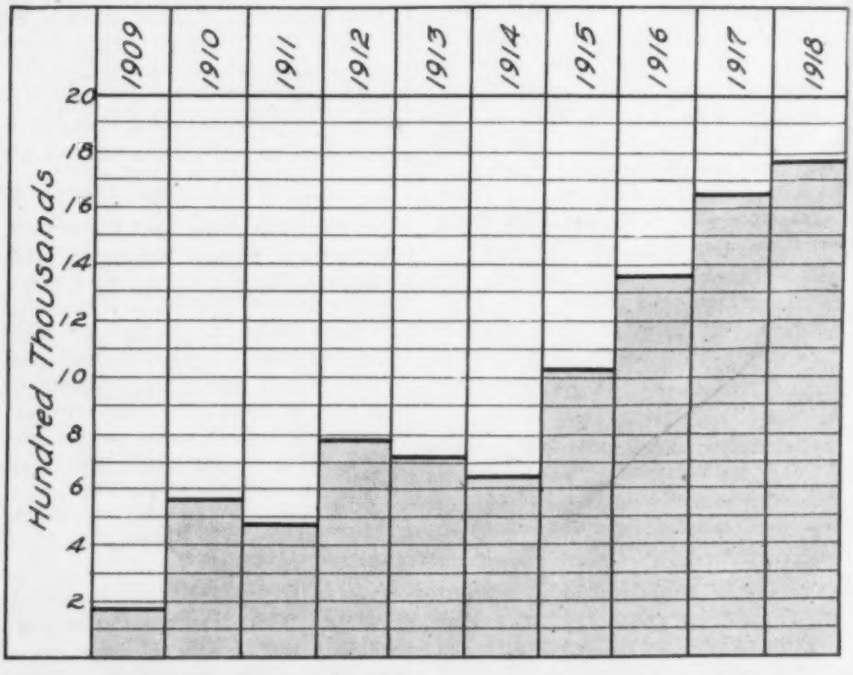


CHART SHOWING GROWTH IN THE PRODUCTION OF ALLOY STEELS IN UNITED STATES

market and being materially interested by the sterling exchange rate, which declined below 4.15. British 80 per cent alloy sold down to and possibly below $95 c.i.f. Baltimore, when the British home quotation was £25 a ton, equivalent to $103.75 in our money with exchange at 4.15, while the freight this way was around $5 a ton. American makers filed a complaint with the federal trade commission against the five importers of British alloy, alleging the offerings of foreign alloy were in violation of the anti-dumping clause of the tariff act. Later, the British home price was reduced to £23, equal to $95.45 at 4.15 exchange, and the export price at the same level, thereafter, quotations on export busines were made of $100 to $105, c.i.f. American port.

Decline Caused Some to Drop

When the market declined, in 1919, the electric furnace makers of ferromanganese practically dropped out of the running. The Southern Manganese Corp., a large electric furnace producer, turned to the manufacture of other alloys. Two merchant blast furnace operators continued to operate some of their furnaces, these operators being the Lavino Furnace Co. and Edward E. Marshall, both of Philadelphia. The Miami Metals Co., Chicago, suspended its furnace operations temporarily, but continued a factor in the market. Seaboard Steel & Manganese Co., Temple, Pa., continued a potential factor, for while it was in the hands of a receiver, application was made to resume its operation, although it was planned to blow in on foundry pig iron. The United States Steel Corp. and some of the independent steel companies continued to make ferromanganese for their own use.

Toward the close of 1919 domestic makers of ferromanganese stated they were losing money on every ton of alloy sold at $110 a ton and would continue in that unfavorable position as long as they had to pay current prices for manganese ore, there being no prospect for a reduction in fuel or labor costs. All costs have advanced sharply, but manganese ore comprises the largest single item. Before the war 50 per cent manganese ore was imported as low as $10 a ton, c.i.f. Atlantic port, equal to 20 cents a unit. At this rate, figuring on 100 to 105 units of ore for one ton of ferromanganese, the ore cost was around $20 to $21 a ton, when the selling price of the alloy was $38 to $45 a ton.

In 1919 it was difficult to buy 50 per cent manganese ore below 60 cents a unit, at which rate the cost per ton of alloy was $60 to $65 a ton, for ore alone. Furthermore, a considerable amount of alloy was made from ore bought before the armistice, on which the cost was $1 a unit or more. Stocks of manganese ore at the time of the armistice amounted to 228,924 tons, while considerably more was under contract. The following table shows supplies of ores containing 35 per cent manganese or more during the past several years:

	Domestic shipments	Imports	Total supplies
1909	1,544	212,765	214,309
1910	2,258	242,348	244,606
1911	2,457	176,852	179,309
1912	1,664	300,661	302,325
1913	4,049	345,090	349,138
1914	2,635	283,294	285,929
1915	9,613	320,778	330,391
1916	31,474	576,321	607,795
1917	129,405	629,972	759,377
1918	305,869	491,303	797,172
*1919	55,000	249,810	304,810

*First eight months of 1919.

In consideration of manganese ore costs, ocean shipping rates take first place, for it is in this respect that British alloy makers have had advantage. America has drawn upon Brazil, Cuba, India and Russia for most of its ore in the past, while England has depended largely on India, Russia and Brazil. In the last few years Brazil and Cuba have furnished the bulk of American ore supplies, the imports in 1918 amounting to 491,303 tons of which 345,877 tons came from Brazil and the bulk of the remainder from Cuba. In the first eight months of 1919 only 1000 tons arrived from India, although at least 10,000 tons were afloat or contracted for. England drew most of the Indian ore, importing this material at low shipping rates frequently carrying the ore as ballast.

War Stimulation Ends

During the war, domestic production of manganese ore was stimulated to conserve vessel space, but the natural desire since the armistice has been for the highest grade ores at the best possible price and domestic production has greatly decreased.

Prices of manganese ore increased sharply during the war in Cuba and Brazil. The following table gives comparative figures on the manganese ore market of 1919 and 1914, the prices being those asked in the open market by the Cuban and Brazilian sellers:

50 PER CENT CUBAN ORE

	1914	1919
Price per ton in Cuba	$8.00 to $10.00	$25.00 to $27.00
Water freight rates	$1.50 to $ 2.50	$ 9.00 to $ 9.50
Total cost per ton	$9.50 to $12.50	$34.00 to $36.50
Cost per unit, Atlantic port	19c to 25c	68c to 73c

50 PER CENT BRAZILIAN ORE

Price per ton in Brazil	$ 7.50	$24 to $25
Water freight rate	$ 2.88	$15 to $16
Total cost per ton	$10.38	$39 to $41
Cost per unit, Atlantic port	21c	79c to 81c

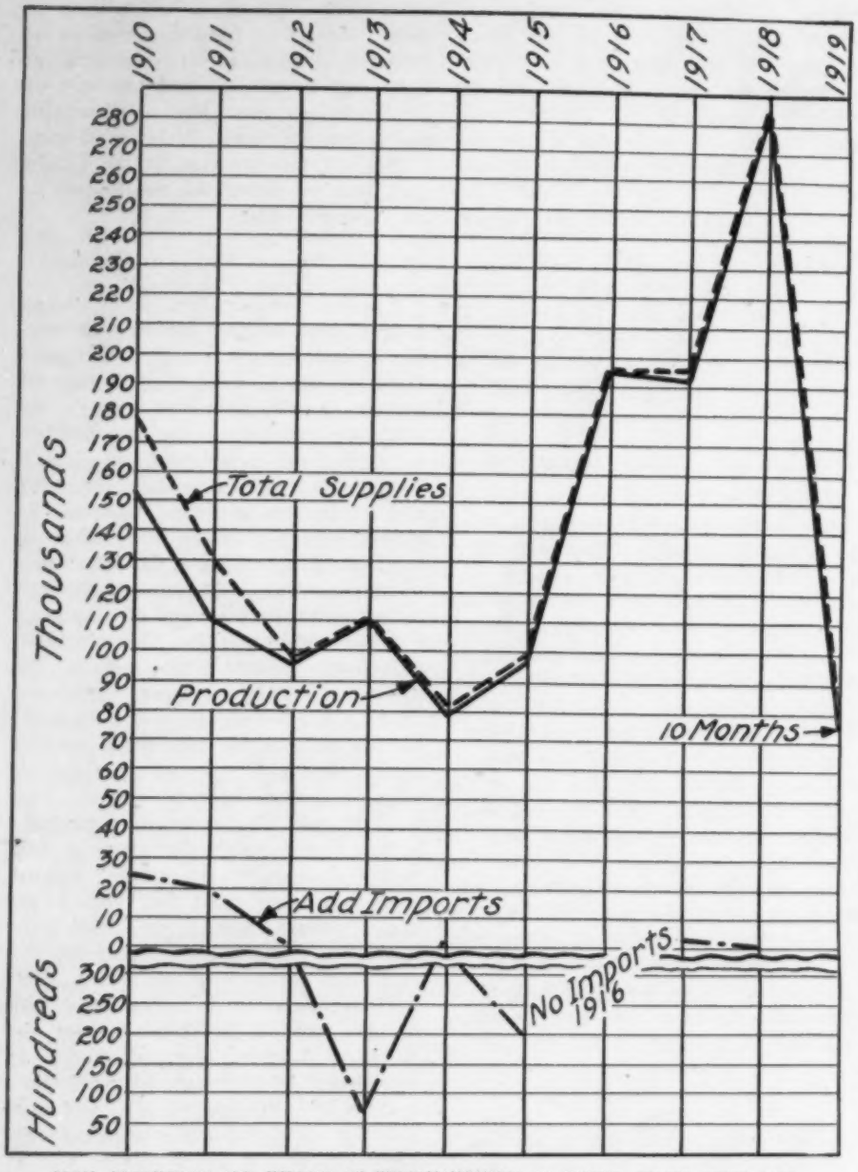
However, it must be said that comparatively little manganese ore was bought for import in 1919. The bulk of arrivals consisted of ore coming in under contract or from mines leased or owned by American alloy makers in Cuba and Brazil. Several tonnages of ore, including some lots of Caucasian and Indian ore, were sold below 60 cents a unit, but this price minus the freight rate, was far below the usual ideas of the foreign sellers.

Ocean Freight Rates a Handicap

Whereas, sooner or later, ocean freight rates will be reduced, the producing costs may be expected to remain fairly constant, consisting largely of hauling charges, labor and taxes in the producing countries. The tax problem is particularly complicated in Brazil. The ocean freight rates have been the real handicap to American makers. The quoted price for Indian manganese ore in Great Britain during the latter part of the year was 2s 3d per unit, although several good sized parcels of Caucasian ore were offered at 2s. On this basis, with exchange at $4.15 to $4.20, the equivalent cost in our money of the ore used by English makers was around $43 to $45 per ton of ferromanganese, as against nearly $60 for ore per ton of alloy, estimated on the domestic market. British labor costs were probably a little lower and its fuel costs a little higher than in this country. Against their advantage must be checked the ocean freight rate from English to American ports, plus railroad freight rate from the port to consumer's plant.

These figures would indicate that with a fair revision in shipping rates the price of American ferromanganese, as established by the cost of production, and the price of imported alloy will compare so closely that the principal consideration of the buyer will be one of deliveries.

In summary, it may be said the ferromanganese market begins the year 1920 with a much improved statistical position, despite the labor troubles of 1919. Stocks at the beginning of the year amounted to 100,000 tons, but production for the first 10 months showed a curtailment of 130,000 tons as compared with output the first 10 months of 1918. Imports the first eight months of 1919 were less by 10,000 tons than in the same period of 1918, when they were about 26,000 tons. With the pressing demand for steel in sight that is manifest both in this country and from abroad, consumption is bound to increase provided labor conditions permit. The manganese ore situation also offers cause for strength in the ferromanganese market. Ore supplies were probably used up much faster than they were brought in during 1919. Alloy producers could not afford to pay the price asked for ore by the ore producers of Brazil,



TOTAL PRODUCTION AND IMPORTS OF FERROMANGANESE IN UNITED STATES SINCE 1910

Cuba and India, plus the freight rates charged. Until the price of the alloy goes up or freight rates are reduced it is likely little ore will be purchased in the open markets of Brazil or Cuba. This premise being sound, supplies of manganese ore will continue to be depleted, until eventually a brisk demand for the alloy will develop a shortage of ore, which may take some months to fill, causing higher prices for ferromanganese.

Curtailment of Production

The general influences affecting the spiegeleisen market, of course, closely parallel those in ferromanganese. The outstanding development in spiegeleisen during 1919 was the sharp curtailment of production of this alloy, as a result of decreased demand and heavy stocks in steelmakers' hands. During the war a number of consumers, especially steel founders, used spiegeleisen in lieu of ferromanganese, which they were unable to obtain. With the end of hostilities they found themselves with large stocks of spiegeleisen on their hands, some of which they resold. With the increased supply of ferromanganese these consumers undoubtedly will return to the use of the higher grade alloy. At the same time, a number of the steelmakers have mixtures which they normally employ, calling for certain amounts of spiegeleisen as well as ferromanganese and so it is expected the future demand for spiegeleisen will remain fairly steady and constant. During the war there was a large export demand for spiegeleisen which makers were unable to touch, but since the armistice a considerable amount of this business was undertaken, at least 15,000 tons having been closed by one producer in the last six months of 1919.

The production of spiegeleisen in the first 10 months of 1919 amounted only to 74,986 tons, according to the monthly blast furnace statistics of the IRON TRADE REVIEW, which compare with a total of 303,491 tons for all of the year 1918. Steel works production of spiegeleisen amounted to 3970 tons in the first 10 months of 1919, as against 97,885 tons in all of 1918. The supplies of spiegeleisen in 1919 and 1918 are shown in the following table:

	1918	First 10 months 1919
Merchant stacks	161,850 tons	53,585 tons
Steelmaking stacks	97,885	3,970
Merchant and steelmaking stacks	43,756	17,431
Total	303,491 tons	74,985 tons

Stocks of spiegeleisen at the time of the armistice are estimated to have been about 85,000 to 90,000 tons, or sufficient for slightly over three months' consumption at the rate then prevailing. Accordingly, supplies of spiegeleisen including stocks and output, amounted to about 160,000 to 165,000 tons the first 10 months of 1919, whereas output in 1918 was 303,491 tons. The following table shows in gross tons production, imports and total supplies of spiegeleisen during the past several years:

	Production	Add imports	Total supplies
1910	153,055	25,383	178,438
1911	110,236	20,970	131,205
1912	96,346	1,015	97,361
1913	110,338	77	110,415
1914	79,935	2,870	82,805
1915	97,885	200	98,085
1916	194,002	....	194,002
1917	192,985	3,968	196,953
1918	283,853	1,969	285,822
*1919	74,986	....	74,986

*10 months.

This table on supplies proves that the statistical position of spiegeleisen, as in ferromanganese, has improved considerably the past year.

Electrolytic Ferrosilicon Grows

In considering the ferrosilicon industry and its prospects, particular attention is called to the manufacture of high grade alloy produced in the electric furnace. This branch of the industry expanded rapidly and broadly to meet the war demand for shell steel. Accordingly, it has had a rough road to travel in peacetime.

The production and consumption of low grade blast furnace ferrosilicon, on the other hand, may be expected to remain fairly constant in peacetime, with supply and prices regulated by general conditions in the iron and steel industry. Production of low grade ferrosilicon ranged from 60,000 to 75,000 tons a year before the war. The American Iron and Steel institute classifies as ferrosilicon all pig iron containing 7 per cent and higher of silicon.

The bulk of the output of high grade ferrosilicon is made up of 50 per cent alloy of silicon and iron, but some 75 per cent, 85 and 90 per

cent alloy also is made. There was only two electric furnace makers of high grade ferrosilicon before the war, but this number was increased to about 15 by 1918, to meet the needs of the shell steel makers. Steel containing up to 2 per cent silicon was required in the manufacture of shell forgings, whereas in its use as a scavenger, ordinary steel practice calls for only a trace of 0.05 per cent silicon. Accordingly, production of this grade was stimulated and much new capacity developed. Capacity of United States plants for making 50 per cent ferrosilicon in 1918 was estimated at 135,000 tons; 70 to 75 per cent, 5000 tons; 80 to 85 per cent, 6000 tons. A Canadian company had capacity for making 3000 tons annually of 90 to 95 per cent alloy. The number of Canadian makers of ferrosilicon reached eight, during the war, with an estimated capacity in 1918 of 60,000 tons. One United States company was able to produce more than half the American output.

Consumption Increases in War Year

Against these figures may be contrasted the estimates of production and consumption before the war. Apparent consumption of high grade ferrosilicon in prewar years was about 30,000 tons, about half of which was imported. In 1914, a year of depressed steel business, consumption was around 15,000 tons. In 1916, consumption reached 60,000 tons and in 1917 and 1918 probably it exceeded 100,000 tons.

Paralleling this fivefold increase in demand, was, of course, a rising market. The price of 50 per cent ferrosilicon averaged around $50 a ton, seaboard, for five or six years before the war. In 1915, however, the market advanced to $71 to $73, the lower price representing large tonnages and the higher price carloads. Late in 1915 the price advanced to $82 to $85 a ton. By the fall of 1916 the market reached $98 to $100. In 1917, an acute shortage developed and prices as high as $300 a ton were obtained, although some makers never asked more than $250, and the principal maker not over $100 a ton. In 1918, the price of 50 per cent alloy averaged about $150 a ton. By May, 1919, the market dropped to $75 a ton and by November recovered to $80 a ton. The decline was accelerated by resales by steelmakers who had surplus stocks of the alloy and later the market was depressed by the offering of stocks of alloy held by American and Canadian plants which were going out of business. Imports of ferrosilicon, however, the first eight months of the year were not heavy, amounting to only 5629 tons; exports in the same period were 9756 tons of all grades, but it is doubtful if much of this was 50 per cent material.

The price of 75 per cent ferrosilicon averaged about $220 a ton in 1918 and declined to $110 to $125 in the fall of 1918. The price of 85 per cent ferrosilicon, used principally in the manufacture of hydrogen gas by the army and navy departments, averaged about $240 in 1918, and 90 per cent, a by-product in the manufacture of carborundum at Niagara Falls, Ont., was about $330. Consumption of the highest grade alloys also decreased in 1919 and prices were largely a matter of negotiations between buyers and sellers.

In the readjustment period, a few electric furnace makers of ferrosilicon have definitely gone out of business and their plants dismantled. Some others did not operate during the year, but were prepared to resume when market conditions were more auspicious. The cost of production of ferrosilicon as of other commodities, increased sharply during the war. Prior to 1915, 50 per cent ferrosilicon could be made and sold with some profit, it is said, at $50 to $60 a ton. But with the market at $80 to $85 in the fall of 1919, even those makers having the lowest power charges reported sales at these prices represented a loss per ton to them. Producers with higher power costs were eliminated definitely. The leading maker is said to have operated its works about 30 per cent most of the year and the average operations of the industry for the year probably were not over 25 per cent.

In summary, it may be said that tht high grade ferrosilicon industry has passed through its worst market stage in the past year of liquidation. Consumption and accordingly production of 50 per cent ferrosilicon will continue, but it will be many years, if ever, before the use of the alloy reaches the scale of the war years. A stable market and a living profit are sought and expected by the industry.

Special Alloy Industry Expands

Of the special ferroalloys used in the manufacture of alloy steels, little has been published statistically. The figures published by the United States geological survey are far from comprehensive, either as to tonnage or value, as much of the production has not been reported to the survey.

Both molybdenum and zirconium steels were developed during the war and there were indications in 1919 that there would be an increasing commercial application of these steels. The better known alloys of tungsten, chrome and vanadium received considerable impetus in wartime and consumption in 1918 and 1917 probably exceeded that of the period immediately following the war. However, the war taught lessons in the usefulness and adaptability of steels containing these alloys. The visit of eminent French engineers to assist this country in war steel production is believed by some people to have had an educational influence in the use of alloy steels. But the most important consideration is the large new demand for special ferroalloy steels used in the automobile and other automotive industries. One automobile maker uses over 100,000 tons annually of a special steel of one analysis. Other automobile makers have adopted material of similar analysis as best adapted for strength, toughness and general wearing qualities and withal lightness. The manufacture of stainless steels was developed during the war in the manufacture of valves and contact points for Liberty motors and other engines and the demand for this class of steel for automobile and airplane valves is growing. Ball steels, containing chromium, are on the increase. Nickel chrome, for electrical and heat-resistance purposes, is being used more and more widely. The growth in the production of alloy steels and accordingly in the call for ferroalloys is indicated by the chart on page 80.

Tungsten Surplus Was Large

The ferrotungsten industry has shared fully in the readjustment of business attendant upon the return of peace. There was a great surplus of tungsten after the armistice, some of which had not been liquidated even a year later. Importers, dealers and bankers in New York held large stocks of concentrates, chiefly low grade Chinese ores. Makers of ferrotungsten and tungsten powder, of whom there were about 20 at the close of 1918, also held large stocks of concentrates and further supplies under contract. The tool steelmakers had big stocks of ferrotungsten and contracts for further supplies. The machine shops and other users of tool steel likewise had large stocks ahead to meet the feverish wartime requirements in the machining of shell steel and other munitions. It is estimated that 30,000 tons of tungsten steel were produced in 1918. With the end of hostilities, supplies were more than sufficient to meet the de-

Tungsten Supplies in United States Over Period of Years

From Preliminary Report on the Mineral Resources of the United States by United States Geological Survey. Figures in Gross Tons.

		IMPORTS			EXPORTS†		
Year	Domestic production Tungsten ore	Tungsten ore	Tungsten and Ferrotungsten	Estimated equivalent in ore carrying 60 per cent WO3*	Tungsten and Ferrotungsten	Estimated equivalent in ore carrying 60 per cent WO3	Apparent Consumption‡
1912	1330	824	323	1,551	....	....	2,881
1913	1537	449	740	2,114	....	....	3,651
1914	990	299	218	789	....	....	1,779
1915	2332	1,776	8	1,794	....	....	4,126
1916	5,923	3,973	43	4,070	287	580	9,413
1917	6144	4,876	1	4,878	1162	2420	8,602
1918	5041	11,750	...	11,750	618	1265	15,526

*These items include the ore (considered as carrying 60 per cent WO3) and the tungsten and ferrotungsten (considered as equivalent to 2¼ times their weight in ore carrying 60 per cent WO3).

†No record of tungsten ore exported is at hand, although it is known that some has been shipped abroad. The apparent consumption is at best only an approximation.

‡Production plus imports minus estimated equivalent in ore of the exports of tungsten and ferrotungsten.

creased demand and the markets for tungsten concentrates, ferrotungsten and high speed steel declined.

After having reached a high record level of $100 a unit in wartime, world production of tungsten concentrates was sufficiently stimulated to bring quotations down to about $22 to $24 for high grade concentrates, at the time of the armistice. During 1919 the quotation for high grade wolframite declined to $8 a unit, later recovering to about $10 a unit for a prime Bolivian wolframite. In the autumn of 1919, low grade Chinese ores, containing 60 to 65 per cent WO_3 but with no guarantee as to impurities, was obtainable at $7.25 a short ton unit, spot, New York. The price of high grade American scheelite, after dropping below $10 a unit, was advanced to $15 a unit, f.o.b. mines, by the western producers.

Similarly, the price of ferrotungsten declined. The decrease in price amounted to more than 50 per cent during the year. At the armistice, standard ferrotungsten was quoted about $2.40 a pound contained, but by the autumn of 1919 domestic makers were taking business at $1.25 a pound contained and lower. The decline was accelerated by import offerings of British and French ferrotungsten. Some British ferrotungsten was sold in the fall of 1919 as low as 85 cents a pound contained, duty paid, the duty being 15 per cent ad valorem. Several sales were made below $1 a pound contained.

Ferrotungsten Future in Doubt

Toward the close of 1919, the ferrotungsten industry was faced with the question as to whether it would be able to maintain the relative world position gained during the war, or whether it would have to yield place to the European makers who supplied a large portion of the requirements of this country in prewar years. However, in spite of the lower prices quoted on foreign offerings, domestic makers of ferrotungsten continued to take business.

The British home quotation for ferrotungsten in the autumn of 1919 was 2s 11½d per pound contained, for 75 to 85 per cent alloy, low carbon. This price was equivalent to slightly less than 60 cents a pound in American money.

The official British price for tungsten concentrates Nov. 1 was 32s 6d a unit, equal to about $6.60 a unit at $4.15 exchange. However, business was done considerably below this figure. It is understood considerable quantities were sold at $6.30 a unit, although this was low grade ore. On the basis of $6.30 a unit ore cost, figuring an average recovery of 85 per cent in reduction, the cost per pound of the contained tungsten alone figured close to 37 cents a pound, without including conversion cost and other expenses. American makers have favored the use of a higher grade of concentrates and have paid a correspondingly higher price for the tungsten contents of their product. Representative Timberlake, of Colorado, introduced a bill in the house at Washington, proposing a duty of $10 a unit on imports of tungsten concentrates. This bill was in line with the desires of the western tungsten producers, who maintained they could not operate their mines at a price below $15 a unit, whereas Chinese concentrates were being laid down in this country at around $7 a unit. The duty of $10 a unit was equivalent to about $1 a pound for contained tungsten in ferrotungsten and tungsten powder. This bill passed the house with an amendment calling for a duty on stocks of imported ore already in this country amounting to the difference between the cost of the ore and $17 a unit. This bill and particularly the amendment met with bitter opposition from consumers using foreign ores, including both some ferrotungsten makers and tool steel manufacturers, as well as importers. The bill was held in the senate finance committee for some months.

Normal Demand 2000 Tons

The normal demand for tungsten ores in the United States amounted to about 2000 tons annually. The accompanying table shows in a general way the supplies of tungsten ores the past several years.

It will be noted from the table on tungsten supplies that in prewar years this country imported something less than one-half its requirements but that during the war the proportion of foreign ores used increased sharply. Unfortunately, no accurate figures as to the production of ferrotungsten are available. The United States geological survey reported a production of 1258 gross tons of ferrotungsten in 1917 and 2142 gross tons in 1918. However, as supplies of tungsten ore were about 11,000 tons in 1917 and nearly 17,000 tons in 1918, it is obvious that the domestic production of ferrotungsten is far greater than estimated. This is due, no doubt, to the great reluctance of some ferroalloy makers to report their production figures to the survey.

Exports of ferrotungsten the first nine months of 1919 amounted to about 12 gross tons, as against 618 tons in all of 1918 and 1162 tons in 1917. Imports of tungsten-bearing ore amounted to 5843 tons the first nine months of 1919, compared with 11,750 tons in 1918 and 299 tons in 1914.

The ferrochrome industry faced

(*Concluded on Page* 88)

War Steel Fills Uses of Peace

Great Tonnage at End of Hostilities Moves Into Consumption With Minimum Dislocation of Market—Tons Are Disposed of—Shell Material is Converted into Reinforcing Bars, Small Angles and Other Products

BY G. H. MANLOVE

WITH the steel industry of the United States speeding at its highest rate to provide the sinews of war, a war in which steel played a leading part, the armistice of little more than a year ago was the signal for an emergency stop that called for fine judgment and unusual care to avoid a catastrophe. The speeding limited, traveling at the highest speed that steam from straining boiler can give, cannot be expected to be stopped as by a stone wall without a wreck resulting. Steam already generated must have an outlet and the steel already made for battle purposes raised a big problem as to its disposal immediately the insatiate maw of modern war had been closed.

Fortunately those who wrought the steel into form for its destined use were working fast, and the tonnage between mill and shellmaker or shipbuilder at any given moment was not as large as might have been expected. Shipbuilders were forming and riveting steel plates to the ribs of the ship almost as fast as they were received from the mill, and shellmakers were cutting rounds to lengths and machining them.

Thus the slack of unused material never was large compared with the tonnage being produced and consumed in the uses of war. But while it was comparatively small, it was actually large when measured in tons. After the armistice, it no longer was needed for war purposes and its composition and form were such that it did not fit into peace uses unless further treated to make it suitable in analysis or in shape.

Much speculation was indulged in as to the effect this material would have on the market and how it could be absorbed without interfering with the orderly progress of trade. It was not possible to determine the tonnage thus overhanging the market. The general idea was that it was immense and would blanket the market for some time and have a depressing effect.

Government Hold the Material

All this steel was the property of the government in effect. Even where it was bought direct by the user without the government acting as the intermediary, in the settlement of contracts it passed to the latter whenever it was not suited to peacetime production of the plants in whose possession it chanced to be. While red tape of government agencies usually is execrated by business men accustomed to making their own decisions quickly and who chafe at delays imposed by bureaucrats at Washington, in this instance it served a good purpose. It delayed the marketing of the material until general conditions had reshaped themselves and the business world was ready to receive it without a jar.

Though the armistice came Nov. 11, 1918, no important sale of war steel was made by the government until about May 1, 1919, a period of close to six months. In that interval a number of factors had developed to outline the situation clearly and many of the fears formerly expressed as to the effect of war steel on the market had been banished. Thus the industry was in a position to meet the outpouring of material calmly and to absorb it without a jar.

But once the process was begun it was carried on with speed and by the first anniversary of the armistice the government had disposed of most of the steel, the remainder still in its hands being a small percentage of the total and of negligible consequence as a further factor. Thus after six months preparation another six

BILLETS FOR THE PRODUCTION OF WAR MATERIAL PILED IN MILL YARD. MUCH OF THIS FORM OF STEEL WAS LEFT AS GOVERNMENT PROPERTY AT TIME OF ARMISTICE

months saw the entire tonnage absorbed and out of the way, barring a comparatively small quantity of special steels which can be disposed of without affecting the situation in the least.

During the time between the armistice and May 1, 1919, when the government began selling its steel, the effort of the industrial board to stabilize prices had been tried and had failed and the pause in business resulting from the uncertainty this caused had passed. Consumers had measured the situation and formed their opinions of the future, peace demand for articles of steel and iron had begun to assert itself and pressure for raw materials came to the front in heavier volume than steel mills could meet after the latter had been on a reduced schedule of operation during the first half of the year.

Slackened operations of shops working steel into its finished forms for use had resulted in much less scrap being produced than usual and there was scarcity of tonnage of this character. Consumers of scrap found it difficult to fill their needs from usual sources and prices soon started upward with promise of new high records being made. The apex was reached in August when the heavier volume of selling of government steel was met, and this, with other factors, sent the price downward moderately.

The fact was that diversion of nearly all the country's steel into war channels for two or three years had reduced the outflow of scrap from usual sources, as the greater part of the steel for war was sent out of the country and returned no scrap. Thus the normal tonnage was interrupted at the source and a gap created which could not be filled at once. Into this gap the government accumulations were fed gradually as the red tape was unwound and at no time was there sufficient selling to break the market or place more material before buyers than they could consume.

Helped to Stabilize Scrap

In fact, it is believed the war steel, such as was utilized as scrap prevented old material prices rising to a high point because of scarcity. Had the war continued scrap would have been difficult to obtain in 1919, but under circumstances as they have come about, the scarcity has been pushed along to a future period when the war steel shall have been completely assimilated and stable conditions shall have reappeared. Other factors may intervene to distribute this shortage over a long period instead of producing a sharp famine. But a scarcity seems inevitable and many observers predict a general range of about $30 for scrap in 1920, because of the light supply.

When the war ended and pressure on mills and manufacturers was removed, every step from the finishing mill at the steel works to the delivered shell, gun, cannon, transport equipment and a thousand other products held a tonnage of more or less raw material, partially finished articles and completed products, all rendered practically useless in a moment. It seemed a tremendous undertaking to resolve this into condition for absorption on a peace basis. It was evident the government must bear the losses incident to the sudden change of program as the individuals and plants whose activities had been suspended could not be expected to do so.

Disposal of Materials

Materials in France have been disposed of to the French government; material in the hands of American manufacturers was sold direct to them on advantageous terms wherever it could be used in their several lines of peacetime production. But war steel is high carbon, usually 0.45 to 0.65, while most of the manufacturers in this country use soft steel. Thus there remained unplaced a large tonnage of shells in every stage of manufacture, bars intended for shells, forgings, forging bars, billets of many sizes and shapes and various special steels.

This accumulation divided itself naturally, though rather roughly, into two classes, shell scrap and shell bars. The former includes shells, complete and in every stage of completion, defective shells failing to pass inspection, forgings, slugs and shell blanks. Because of their size, shape and partial completion they were useless for any other use than for remelting in the cupola, the electric furnace or the open hearth. Thus when war activity was suspended every piece of steel that had been sawed to shell length and partially machined, parts of shells, forgings for shells and completed shells not yet loaded and shipped to the front became simply scrap, suitable for remelting and casting or rolling into some new form. No other use could be devised. This material was classified as low phosphorus heavy melting steel, and many large users paid premiums up to $2 over the market for it. While actual figures as to the tonnage of such material have not been compiled estimates based on sales and statements issued by the government from time to time indicate that about 700,000 tons were handled during the year and sold for remelting.

The other class of war steel, heretofore called shell bars, was the same grade of steel but had not been cut into lengths or machined. This fact vastly increased the possibilities of its utilization and classed it as semifinished steel, billets or bars, according to its size. It could be heated and rolled into a wide variety of products, according to the needs of various users. Its carbon content being high, the resulting products were classed as high-carbon and no change could be made in its constituents, while the scrap steel passing through the open hearth reappeared as soft steel, a metallurgical change having been wrought.

Bars up to 6 inches in diameter were suited to rerolling or to forging while larger sizes could be used best for forging. This class of steel totaled about 500,000 tons, according to reliable estimates. It was sold largely to brokers who supplied it to consumers and the latter rerolled or forged it into forms needed for peace purposes. The steel thus replaced similar material which otherwise would have been bought direct from steel producers. In some instances the bars were bought by users of angles, various structural shapes, etc., the conversion was done by a mill suitably equipped and the product returned to the owner of the bars. Thus the manufacturer of steel beds bought a tonnage of war steel, had it shipped to a rerolling mill for conversion and the angles, bars and tubes produced from it were sent to his plant for fabrication.

Helped Supply Demand

Availability of the government's tonnage of this class of material during the middle of the year, at a time when demand was heavier than mills could meet, assisted greatly in supplying the needs of consumers and prevented a shortage of semifinished steel of this quality. The relative scarcity of rerolling rails was great, and the war steel in a measure relieved the pressure for that material. Much of this steel was rerolled to sizes suitable for automobile forging stock, possession of heat numbers and analysis making it possible to select steel exactly suited to the needs of the forgings. This supplied steel for this purpose in a way to relieve demand on mills and usually it could be obtained at a less price than material direct from the producers.

Prices obtained for bars rerolled from shell steel were equal to those

for new mill stock as they were in every respect the same in analysis and physical characteristics. Where these rounds were bought by brokers and resold to mills as raw material, the profit was divided. Where consumers of the finished product were the buyers, paying a mill for conversion, the user obtained his product at a saving.

The government has kept a more or less accurate record of the disposition of its material and announces that 90 per cent was sold to scrap dealers or brokers and the remaining 10 per cent direct to users. The latter is made up for the most part of special steels and tool steel, material such as is handled in small lots at high prices and is not so attractive to scrap dealers since its ultimate market is restricted.

The value of the scrap dealer as an efficient distributer of material was demonstrated in this instance as never before. The large dealer was able to bid on heavy tonnages and through his knowledge of the needs of consumers to place the material where it could be used to best advantage, a service the government was not equipped to perform for itself. From his knowledge of where the war steel would be needed, the dealer was able to assume the responsibility for large tonnages and to dispose of these gradually where most needed. He made it easier for the consumer to buy in smaller lots than the government would sell, and the profit on the transaction did not add greatly to the latter's cost.

Auto Builders Are Buyers

In the 10 per cent of steel sold direct to users was included much steel in the hands of automobile builders who would have fabricated it for vehicles for the government. It was of definite use to them in constructing cars for peace uses, and they were the logical buyers. Tool steel bought for government use in various machine shops engaged on government work also was sold direct to the plants in whose possession it chanced to be, since it was as useful for the normal processes of peace.

Collection of definite information as to what the government had on hand for sale seemed to culminate in October and the cleanup was started, to dispose of the final accumulations. As a result figures were asked on fairly large lots and practically the entire offering was sold to two dealers large enough to handle them. Briggs & Turivas, of Chicago, with offices in various other centers, took over approximately 100,000 tons of shells and shell scrap located in various manufacturing centers. This was soon disposed of for heavy melting steel among steel founders and open hearth steel works, the most of it being taken in fairly large tonnages by important consumers. At about the same time E. A. Schwartzenberg, of Cleveland, bought about 106,000 tons of shell steel billets which go to rerolling purposes. Inasmuch as each of these purchases involves $2,000,000 to $3,000,000 at the purchase price, it is to be seen that the larger scrap dealer has come to be a prominent factor in distribution.

When these tonnages had been closed, the announcement was made that the remainder in the hands of the ordnance department totaled about 149,000 tons. This department has moved practically all the steel in the government's hands, that disposed of by other departments being negligible. The unsold tonnage is miscellaneous, the largest single item being about 25,000 tons of cold-rolled screw stock steel and hot rolled bars. Miscellaneous scrap which has not been classified totaled about 40,000 tons at that time, a tonnage which would be absorbed by the market without a ripple. The remainder of the unsold tonnage included ingots, blooms, sheets, plates, rods, pipe and small lots of ferrosilicon, spiegeleisen, and special steels.

Thus the steel originally intended for war, for shells in large measure,

SHELL BLANKS IN YARD OF MUNITION PLANT. THIS IS AN EXAMPLE OF THE TREMENDOUS TONNAGE OF STEEL THAT WAS AWAITING THE FINISHING PROCESS WHEN THE WAR ENDED

as well as for transport and other purposes, has been halted in its course and diverted to peace uses. It now is serving as parts of agricultural implements and of steel beds, as reinforcing bars in concrete structures as the result of rerolling the uncut bars and billets. The steel that had started its actual journey toward finished shells has been put back through the melting processes in cupola or open-hearth furnace and has emerged as soft steel. It thus has been mingled with the great river of finished products and its identity has been lost.

Some other war steel has figured in the case from a different angle. Steel and wire bought in the United States by some of the allied governments was in process or awaiting shipment when the war ended and was not forwarded, the need having passed. This was sold in large measure in the United States by the governments to which it belonged. Most was taken by brokers who disposed of it in small lots to consumers or applied it on export orders for private account. Thus some of the wire intended for entanglements was shipped to Europe after the war for the uses of peace. Other lots were shipped to South America. Some of the wire was sold back to manufacturers in this country.

Of the steel on contract in this country for account of the allied governments, the French substituted other forms, such as structural shapes and plates, for the shell bars they had bought. This assisted the mills by giving the latter tonnage to roll while domestic business was readjusting itself. England continued to accept delivery on its contracts for some time after the armistice and of heavier products, billets and heavy bars, all the allies continued to accept delivery, as these could be used for peace as well as for war purposes.

That the sale of the government's surplus steel was not a burden on the American market is shown by the fact that one American house, Briggs & Turivas, Chicago, bought from the Imperial Munitions Board of Canada about 250,000 tons of shell scrap which was brought into the United States and sold to melters here.

Of the steel manufactured in this country and sent to Canada to be machined into shells for the United States government, under contracts, all was returned here after the war and became part of the government's holdings. Had it been sold in Canada it would have been subject to the heavy import duty imposed by that government on steel materials entering from the United States.

Outlook For America's Ferroalloy Industry

(*Concluded from page* 84)

much the same conditions in 1919 as confronted the ferrotungsten industry. This alloy, which is used to a great extent in the manufacture of alloy steels, particularly for the automotive industries, also in the production of hard-cutting tools, was selling at about 40 cents a pound contained for standard alloy at the time of the armistice. Ferrochrome containing 60 to 70 per cent chromium and 6 to 8 per cent carbon is usually considered a standard alloy. A year later, this grade was quoted 27 to 30 cents by domestic makers. During the year, however, French and British ferrochrome was sold at 20 cents a pound contained, duty paid, the duty being 15 per cent ad valorem. In fact, some small sales as low as 16 cents a pound contained were reported, imports being facilitated by low exchange rates.

A bill imposing tariff duties on chrome was introduced in the house by Representative Kahn, of California. It provided the following duties:

Crude chrome ores and concentrates thereof—60 cents a unit, a unit being defined as 1 per cent of the chrome contents in a short ton of 2000 pounds.

Ferrochrome and other metallic alloys containing chrome—11½ cents for each pound of metallic chromium contained therein.

Refractory brick and material used for refractory purposes containing chrome—60 cents per unit of chrome.

Chemical compounds and articles manufactured therefrom containing chrome or chromite—90 cents per unit of chromium content.

This bill was introduced at the desire of the California producers of chrome ore, who built up a business during the war and were loath to see it pass. The following table shows in gross tons the nature of American supplies of chrome ore in recent years, whether domestic or foreign:

	Domestic Production	Imports	Total supplies
1910	205	38,579	38,784
1911	120	37,540	37,660
1912	201	53,929	54,130
1913	255	65,180	65,435
1914	591	80,736	81,327
1915	3,281	76,455	79,736
1916	47,035	115,945	162,980
1917	43,725	72,063	115,788
1918	82,350	100,224	182,574
*1919	....	29,324	.....

*Imports for first eight months of 1919; production figures for 1919 not yet available.

Prewar foreign chrome sold at $14.50 to $15.50 a ton, delivered American consumers' plants, equal to about 30 to 35 cents a unit for 50 per cent ore. During the war high grade chrome ore sold up close to $2 a unit and 40 per cent ore sold at $1.40 a unit. In 1919, the market declined to around 90 cents to $1 a unit for New Caledonian ores, spot New York, some sales being reported at 80 cents.

It is estimated that 1918 capacity for producing ferrochrome was about 25,000 tons. No separate statistics on this alloy have been kept by the various government bureaus, as regards production, imports or exports. Neither has the American Iron and Steel institute any statistical record of ferrochrome. There were only two makers of ferrochrome before the war, but wartime demand stimulated production, so that there were about 10 makers of ferrochrome at the close of 1918, some of whom have since dropped out. In addition to the standard ferrochrome, other grades running lower in carbon are produced, including carbon 4 to 6 per cent, 2 to 4 per cent under 2 per cent and carbon free. In summary, it would seem that the ferrochrome outlook depends in a large measure upon the outcome of the tariff question in congress. Peacetime consumption undoubtedly is on the increase, but it is a question whether the imposition of a tariff of the nature proposed would build up the domestic manufacture of the alloy. Most ferrochrome makers oppose the duty on ores, but would welcome a tariff on the alloy. A 60-cent duty on foreign ores would bring the price of foreign ores to at least $1.50 a unit, in view of the prevailing high ocean freight rates. This would throw most of the business to the domestic producers and it is certain that they could not supply the demand for high grade ores. On the other hand, foreign competition in the alloy was pressing during much of 1919 and prospects were for continued keen competition. On Nov. 1 the British home price was £50 a ton for an alloy of 60 per cent chromium, and 4 to 6 per cent carbon, with premiums for chromium above 60 per cent. This was equal, at $4.15 exchange, to about 15½ cents per pound contained, English port, or about 18½ cents, c.i.f. American port, duty paid. In any event, domestic makers experienced a brisk demand for ferrochrome the last of 1919.

No accurate statistics have been published in respect to the production or consumption of ferrovanadium, but it is probable that the rate of production reached 1500 tons annually of contained vanadium in 1918. There were six manufacturers of ferrovanadium toward the close of 1919, one of which probably contributed close to two-thirds of the total production. In 1919 production difficulties reduced the alloy from mineral mined in Peru.

January 1, 1920

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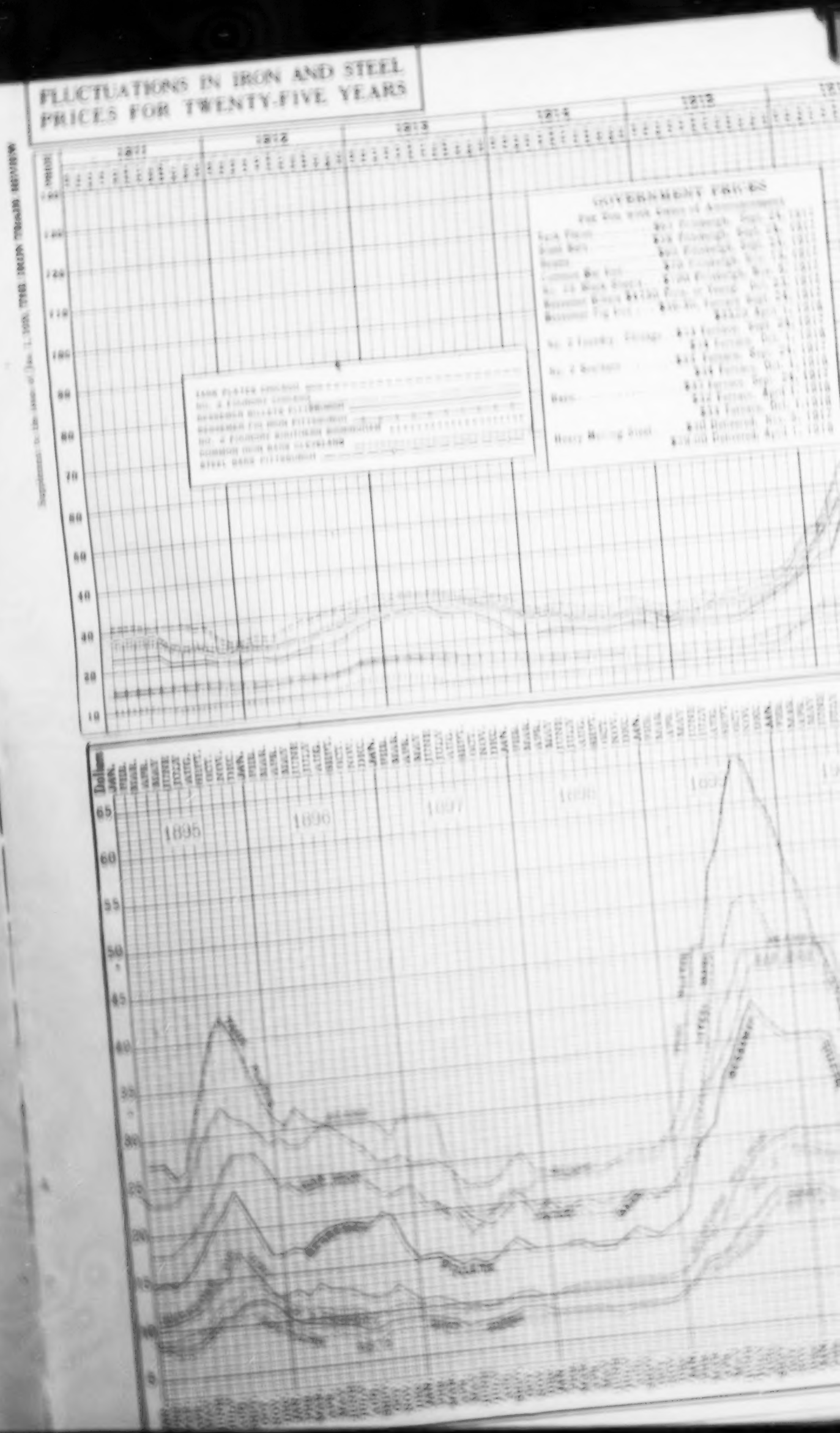

THE IRON TRADE REVIEW

Tungsten Supplies in United States Over Period of Years

From Preliminary Report on the Mineral Resources of the United States by United States Geological Survey. Figures in Gross Tons.

		IMPORTS			EXPORTS†		
Year	Domestic production Tungsten ore	Tungsten ore	Tungsten and Ferrotungsten	Estimated equivalent in ore carrying 60 per cent WO3*	Tungsten and Ferrotungsten	Estimated equivalent in ore carrying 60 per cent WO3	Apparent Consumption‡
1912	1330	824	323	1,551	....	....	2,881
1913	1537	449	740	2,114	....	....	3,651
1914	990	299	218	789	....	....	1,779
1915	2332	1,776	8	1,794	....	....	4,126
1916	5,923	3,973	43	4,070	287	580	9,413
1917	6144	4,876	1	4,878	1162	2420	8,602
1918	5641	11,750	...	11,750	618	1265	15,526

*These items include the ore (considered as carrying 60 per cent WO3) and the tungsten and ferrotungsten (considered as equivalent to 2¼ times their weight in ore carrying 60 per cent WO3).

†No record of tungsten ore exported is at hand, although it is known that some has been shipped abroad. The apparent consumption is at best only an approximation.

‡Production plus imports minus estimated equivalent in ore of the exports of tungsten and ferrotungsten.

creased demand and the markets for tungsten concentrates, ferrotungsten and high speed steel declined.

After having reached a high record level of $100 a unit in wartime, world production of tungsten concentrates was sufficiently stimulated to bring quotations down to about $22 to $24 for high grade concentrates, at the time of the armistice. During 1919 the quotation for high grade wolframite declined to $8 a unit, later recovering to about $10 a unit for a prime Bolivian wolframite. In the autumn of 1919, low grade Chinese ores, containing 60 to 65 per cent WO_3 but with no guarantee as to impurities, was obtainable at $7.25 a short ton unit, spot, New York. The price of high grade American scheelite, after dropping below $10 a unit, was advanced to $15 a unit, f.o.b. mines, by the western producers.

Similarly, the price of ferrotungsten declined. The decrease in price amounted to more than 50 per cent during the year. At the armistice, standard ferrotungsten was quoted about $2.40 a pound contained, but by the autumn of 1919 domestic makers were taking business at $1.25 a pound contained and lower. The decline was accelerated by import offerings of British and French ferrotungsten. Some British ferrotungsten was sold in the fall of 1919 as low as 85 cents a pound contained, duty paid, the duty being 15 per cent ad valorem. Several sales were made below $1 a pound contained.

Ferrotungsten Future in Doubt

Toward the close of 1919, the ferrotungsten industry was faced with the question as to whether it would be able to maintain the relative world position gained during the war, or whether it would have to yield place to the European makers who supplied a large portion of the requirements of this country in prewar years. However, in spite of the lower prices quoted on foreign offerings, domestic makers of ferrotungsten continued to take business.

The British home quotation for ferrotungsten in the autumn of 1919 was 2s 11½d per pound contained, for 75 to 85 per cent alloy, low carbon. This price was equivalent to slightly less than 60 cents a pound in American money.

The official British price for tungsten concentrates Nov. 1 was 32s 6d a unit, equal to about $6.60 a unit at $4.15 exchange. However, business was done considerably below this figure. It is understood considerable quantities were sold at $6.30 a unit, although this was low grade ore. On the basis of $6.30 a unit ore cost, figuring an average recovery of 85 per cent in reduction, the cost per pound of the contained tungsten alone figured close to 37 cents a pound, without including conversion cost and other expenses. American makers have favored the use of a higher grade of concentrates and have paid a correspondingly higher price for the tungsten contents of their product. Representative Timberlake, of Colorado, introduced a bill in the house at Washington, proposing a duty of $10 a unit on imports of tungsten concentrates. This bill was in line with the desires of the western tungsten producers, who maintained they could not operate their mines at a price below $15 a unit, whereas Chinese concentrates were being laid down in this country at around $7 a unit. The duty of $10 a unit was equivalent to about $1 a pound for contained tungsten in ferrotungsten and tungsten powder. This bill passed the house with an amendment calling for a duty on stocks of imported ore already in this country amounting to the difference between the cost of the ore and $17 a unit. This bill and particularly the amendment met with bitter opposition from consumers using foreign ores, including both some ferrotungsten makers and tool steel manufacturers, as well as importers. The bill was held in the senate finance committee for some months.

Normal Demand 2000 Tons

The normal demand for tungsten ores in the United States amounted to about 2000 tons annually. The accompanying table shows in a general way the supplies of tungsten ores the past several years.

It will be noted from the table on tungsten supplies that in prewar years this country imported something less than one-half its requirements but that during the war the proportion of foreign ores used increased sharply. Unfortunately, no accurate figures as to the production of ferrotungsten are available. The United States geological survey reported a production of 1258 gross tons of ferrotungsten in 1917 and 2142 gross tons in 1918. However, as supplies of tungsten ore were about 11,000 tons in 1917 and nearly 17,000 tons in 1918, it is obvious that the domestic production of ferrotungsten is far greater than estimated. This is due, no doubt, to the great reluctance of some ferroalloy makers to report their production figures to the survey.

Exports of ferrotungsten the first nine months of 1919 amounted to about 12 gross tons, as against 618 tons in all of 1918 and 1162 tons in 1917. Imports of tungsten-bearing ore amounted to 5843 tons the first nine months of 1919, compared with 11,750 tons in 1918 and 299 tons in 1914.

The ferrochrome industry faced

(*Concluded on Page* 88)

War Steel Fills Uses of Peace

Great Tonnage at End of Hostilities Moves Into Consumption With Minimum Dislocation of Market—Tons Are Disposed of—Shell Material is Converted into Reinforcing Bars, Small Angles and Other Products

BY G. H. MANLOVE

WITH the steel industry of the United States speeding at its highest rate to provide the sinews of war, a war in which steel played a leading part, the armistice of little more than a year ago was the signal for an emergency stop that called for fine judgment and unusual care to avoid a catastrophe. The speeding limited, traveling at the highest speed that steam from straining boiler can give, cannot be expected to be stopped as by a stone wall without a wreck resulting. Steam already generated must have an outlet and the steel already made for battle purposes raised a big problem as to its disposal immediately the insatiate maw of modern war had been closed.

Fortunately those who wrought the steel into form for its destined use were working fast, and the tonnage between mill and shellmaker or shipbuilder at any given moment was not as large as might have been expected. Shipbuilders were forming and riveting steel plates to the ribs of the ship almost as fast as they were received from the mill, and shellmakers were cutting rounds to lengths and machining them.

Thus the slack of unused material never was large compared with the tonnage being produced and consumed in the uses of war. But while it was comparatively small, it was actually large when measured in tons. After the armistice, it no longer was needed for war purposes and its composition and form were such that it did not fit into peace uses unless further treated to make it suitable in analysis or in shape.

Much speculation was indulged in as to the effect this material would have on the market and how it could be absorbed without interfering with the orderly progress of trade. It was not possible to determine the tonnage thus overhanging the market. The general idea was that it was immense and would blanket the market for some time and have a depressing effect.

Government Hold the Material

All this steel was the property of the government in effect. Even where it was bought direct by the user without the government acting as the intermediary, in the settlement of contracts it passed to the latter whenever it was not suited to peacetime production of the plants in whose possession it chanced to be. While red tape of government agencies usually is execrated by business men accustomed to making their own decisions quickly and who chafe at delays imposed by bureaucrats at Washington, in this instance it served a good purpose. It delayed the marketing of the material until general conditions had reshaped themselves and the business world was ready to receive it without a jar.

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Slackened operations of shops working steel into its finished forms for use had resulted in much less scrap being produced than usual and there was scarcity of tonnage of this character. Consumers of scrap found it difficult to fill their needs from usual sources and prices soon started upward with promise of new high records being made. The apex was reached in August when the heavier volume of selling of government steel was met, and this, with other factors, sent the price downward moderately.

The fact was that diversion of nearly all the country's steel into war channels for two or three years had reduced the outflow of scrap from usual sources, as the greater part of the steel for war was sent out of the country and returned no scrap. Thus the normal tonnage was interrupted at the source and a gap created which could not be filled at once. Into this gap the government accumulations were fed gradually as the red tape was unwound and at no time was there sufficient selling to break the market or place more material before buyers than they could consume.

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Disposal of Materials

Materials in France have been disposed of to the French government; material in the hands of American manufacturers was sold direct to them on advantageous terms wherever it could be used in their several lines of peacetime production. But war steel is high carbon, usually 0.45 to 0.65, while most of the manufacturers in this country use soft steel. Thus there remained unplaced a large tonnage of shells in every stage of manufacture, bars intended for shells, forgings, forging bars, billets of many sizes and shapes and various special steels.

This accumulation divided itself naturally, though rather roughly, into two classes, shell scrap and shell bars. The former includes shells, complete and in every stage of completion, defective shells failing to pass inspection, forgings, slugs and shell blanks. Because of their size, shape and partial completion they were useless for any other use than for remelting in the cupola, the electric furnace or the open hearth. Thus when war activity was suspended every piece of steel that had been sawed to shell length and partially machined, parts of shells, forgings for shells and completed shells not yet loaded and shipped to the front became simply scrap, suitable for remelting and casting or rolling into some new form. No other use could be devised. This material was classified as low phosphorus heavy melting steel, and many large users paid premiums up to $2 over the market for it. While actual figures as to the tonnage of such material have not been compiled estimates based on sales and statements issued by the government from time to time indicate that about 700,000 tons were handled during the year and sold for remelting.

The other class of war steel, heretofore called shell bars, was the same grade of steel but had not been cut into lengths or machined. This fact vastly increased the possibilities of its utilization and classed it as semifinished steel, billets or bars, according to its size. It could be heated and rolled into a wide variety of products, according to the needs of various users. Its carbon content being high, the resulting products were classed as high-carbon and no change could be made in its constituents, while the scrap steel passing through the open hearth reappeared as soft steel, a metallurgical change having been wrought.

Bars up to 6 inches in diameter were suited to rerolling or to forging while larger sizes could be used best for forging. This class of steel totaled about 500,000 tons, according to reliable estimates. It was sold largely to brokers who supplied it to consumers and the latter rerolled or forged it into forms needed for peace purposes. The steel thus replaced similar material which otherwise would have been bought direct from steel producers. In some instances the bars were bought by users of angles, various structural shapes, etc., the conversion was done by a mill suitably equipped and the product returned to the owner of the bars. Thus the manufacturer of steel beds bought a tonnage of war steel, had it shipped to a rerolling mill for conversion and the angles, bars and tubes produced from it were sent to his plant for fabrication.

Helped Supply Demand

Availability of the government's tonnage of this class of material during the middle of the year, at a time when demand was heavier than mills could meet, assisted greatly in supplying the needs of consumers and prevented a shortage of semifinished steel of this quality. The relative scarcity of rerolling rails was great, and the war steel in a measure relieved the pressure for that material. Much of this steel was rerolled to sizes suitable for automobile forging stock, possession of heat numbers and analysis making it possible to select steel exactly suited to the needs of the forgings. This supplied steel for this purpose in a way to relieve demand on mills and usually it could be obtained at a less price than material direct from the producers.

Prices obtained for bars rerolled from shell steel were equal to those

for new mill stock as they were in every respect the same in analysis and physical characteristics. Where these rounds were bought by brokers and resold to mills as raw material, the profit was divided. Where consumers of the finished product were the buyers, paying a mill for conversion, the user obtained his product at a saving.

The government has kept a more or less accurate record of the disposition of its material and announces that 90 per cent was sold to scrap dealers or brokers and the remaining 10 per cent direct to users. The latter is made up for the most part of special steels and tool steel, material such as is handled in small lots at high prices and is not so attractive to scrap dealers since its ultimate market is restricted.

The value of the scrap dealer as an efficient distributer of material was demonstrated in this instance as never before. The large dealer was able to bid on heavy tonnages and through his knowledge of the needs of consumers to place the material where it could be used to best advantage, a service the government was not equipped to perform for itself. From his knowledge of where the war steel would be needed, the dealer was able to assume the responsibility for large tonnages and to dispose of these gradually where most needed. He made it easier for the consumer to buy in smaller lots than the government would sell, and the profit on the transaction did not add greatly to the latter's cost.

Auto Builders Are Buyers

In the 10 per cent of steel sold direct to users was included much steel in the hands of automobile builders who would have fabricated it for vehicles for the government. It was of definite use to them in constructing cars for peace uses, and they were the logical buyers. Tool steel bought for government use in various machine shops engaged on government work also was sold direct to the plants in whose possession it chanced to be, since it was as useful for the normal processes of peace.

Collection of definite information as to what the government had on hand for sale seemed to culminate in October and the cleanup was started, to dispose of the final accumulations. As a result figures were asked on fairly large lots and practically the entire offering was sold to two dealers large enough to handle them. Briggs & Turivas, of Chicago, with offices in various other centers, took over approximately 100,000 tons of shells and shell scrap located in various manufacturing centers. This was soon disposed of for heavy melting steel among steel founders and open hearth steel works, the most of it being taken in fairly large tonnages by important consumers. At about the same time E. A. Schwartzenberg, of Cleveland, bought about 106,000 tons of shell steel billets which go to rerolling purposes. Inasmuch as each of these purchases involves $2,000,000 to $3,000,000 at the purchase price, it is to be seen that the larger scrap dealer has come to be a prominent factor in distribution.

When these tonnages had been closed, the announcement was made that the remainder in the hands of the ordnance department totaled about 149,000 tons. This department has moved practically all the steel in the government's hands, that disposed of by other departments being negligible. The unsold tonnage is miscellaneous, the largest single item being about 25,000 tons of cold-rolled screw stock steel and hot rolled bars. Miscellaneous scrap which has not been classified totaled about 40,000 tons at that time, a tonnage which would be absorbed by the market without a ripple. The remainder of the unsold tonnage included ingots, blooms, sheets, plates, rods, pipe and small lots of ferrosilicon, spiegeleisen, and special steels.

Thus the steel originally intended for war, for shells in large measure,

SHELL BLANKS IN YARD OF MUNITION PLANT. THIS IS AN EXAMPLE OF THE TREMENDOUS TONNAGE OF STEEL THAT WAS AWAITING THE FINISHING PROCESS WHEN THE WAR ENDED

as well as for transport and other purposes, has been halted in its course and diverted to peace uses. It now is serving as parts of agricultural implements and of steel beds, as reinforcing bars in concrete structures as the result of rerolling the uncut bars and billets. The steel that had started its actual journey toward finished shells has been put back through the melting processes in cupola or open-hearth furnace and has emerged as soft steel. It thus has been mingled with the great river of finished products and its identity has been lost.

Some other war steel has figured in the case from a different angle. Steel and wire bought in the United States by some of the allied governments was in process or awaiting shipment when the war ended and was not forwarded, the need having passed. This was sold in large measure in the United States by the governments to which it belonged. Most was taken by brokers who disposed of it in small lots to consumers or applied it on export orders for private account. Thus some of the wire intended for entanglements was shipped to Europe after the war for the uses of peace. Other lots were shipped to South America. Some of the wire was sold back to manufacturers in this country.

Of the steel on contract in this country for account of the allied governments, the French substituted other forms, such as structural shapes and plates, for the shell bars they had bought. This assisted the mills by giving the latter tonnage to roll while domestic business was readjusting itself. England continued to accept delivery on its contracts for some time after the armistice and of heavier products, billets and heavy bars, all the allies continued to accept delivery, as these could be used for peace as well as for war purposes.

That the sale of the government's surplus steel was not a burden on the American market is shown by the fact that one American house, Briggs & Turivas, Chicago, bought from the Imperial Munitions Board of Canada about 250,000 tons of shell scrap which was brought into the United States and sold to melters here.

Of the steel manufactured in this country and sent to Canada to be machined into shells for the United States government, under contracts, all was returned here after the war and became part of the government's holdings. Had it been sold in Canada it would have been subject to the heavy import duty imposed by that government on steel materials entering from the United States.

Outlook For America's Ferroalloy Industry

(*Concluded from page* 84)

much the same conditions in 1919 as confronted the ferrotungsten industry. This alloy, which is used to a great extent in the manufacture of alloy steels, particularly for the automotive industries, also in the production of hard-cutting tools, was selling at about 40 cents a pound contained for standard alloy at the time of the armistice. Ferrochrome containing 60 to 70 per cent chromium and 6 to 8 per cent carbon is usually considered a standard alloy. A year later, this grade was quoted 27 to 30 cents by domestic makers. During the year, however, French and British ferrochrome was sold at 20 cents a pound contained, duty paid, the duty being 15 per cent ad valorem. In fact, some small sales as low as 16 cents a pound contained were reported, imports being facilitated by low exchange rates.

A bill imposing tariff duties on chrome was introduced in the house by Representative Kahn, of California. It provided the following duties:

Crude chrome ores and concentrates thereof—60 cents a unit, a unit being defined as 1 per cent of the chrome contents in a short ton of 2000 pounds.

Ferrochrome and other metallic alloys containing chrome—11½ cents for each pound of metallic chromium contained therein.

Refractory brick and material used for refractory purposes containing chrome—60 cents per unit of chrome.

Chemical compounds and articles manufactured therefrom containing chrome or chromite—90 cents per unit of chromium content.

This bill was introduced at the desire of the California producers of chrome ore, who built up a business during the war and were loath to see it pass. The following table shows in gross tons the nature of American supplies of chrome ore in recent years, whether domestic or foreign:

	Domestic Production	Imports	Total supplies
1910	205	38,579	38,784
1911	120	37,540	37,660
1912	201	53,929	54,130
1913	255	65,180	65,435
1914	591	80,736	81,327
1915	3,281	76,455	79,736
1916	47,035	115,945	162,980
1917	43,725	72,063	115,788
1918	82,350	100,224	182,574
*1919	....	29,324	.....

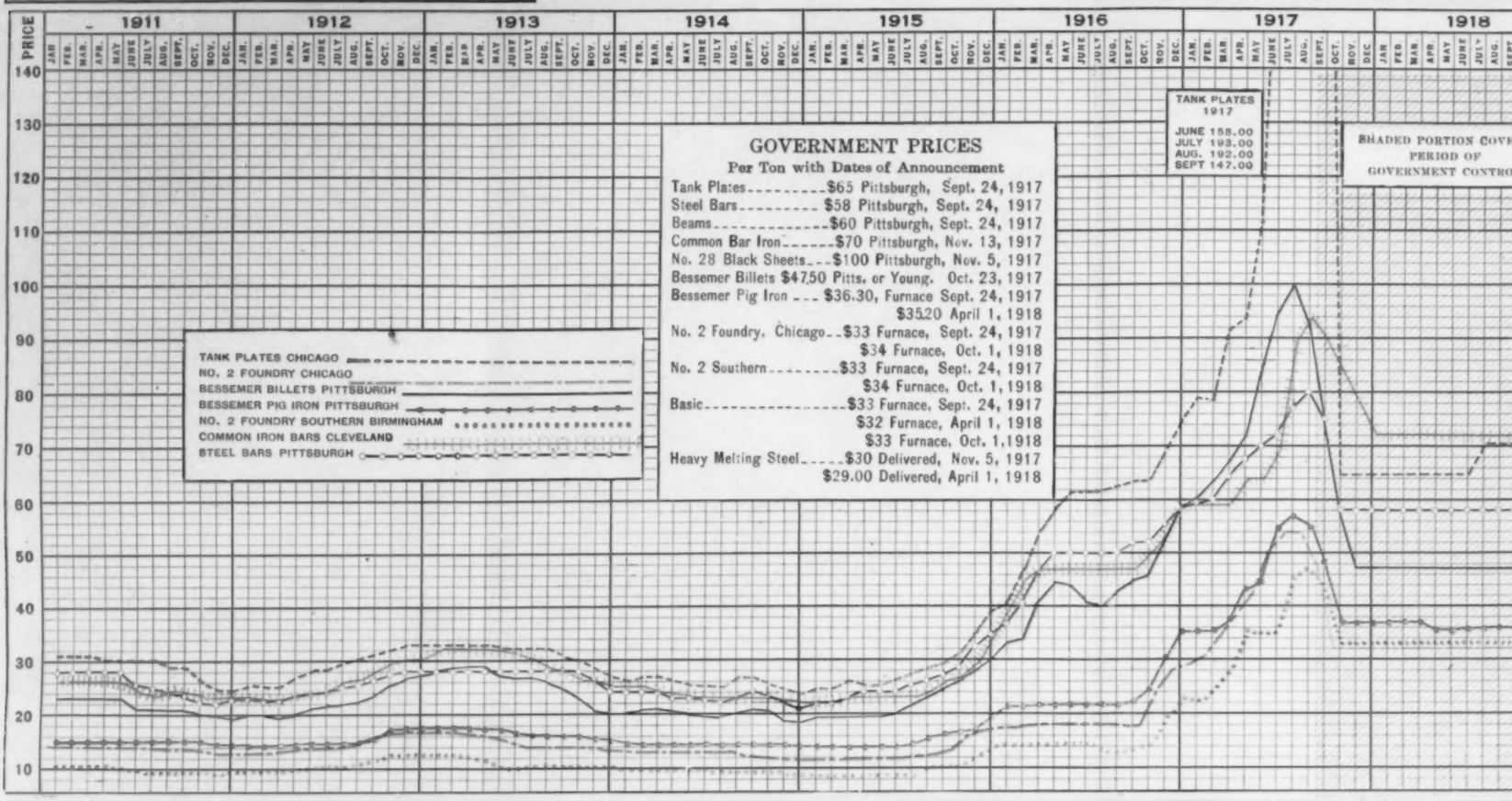
*Imports for first eight months of 1919; production figures for 1919 not yet available.

Prewar foreign chrome sold at $14.50 to $15.50 a ton, delivered American consumers' plants, equal to about 30 to 35 cents a unit for 50 per cent ore. During the war high grade chrome ore sold up close to $2 a unit and 40 per cent ore sold at $1.40 a unit. In 1919, the market declined to around 90 cents to $1 a unit for New Caledonian ores, spot New York, some sales being reported at 80 cents.

It is estimated that 1918 capacity for producing ferrochrome was about 25,000 tons. No separate statistics on this alloy have been kept by the various government bureaus, as regards production, imports or exports. Neither has the American Iron and Steel institute any statistical record of ferrochrome. There were only two makers of ferrochrome before the war, but wartime demand stimulated production, so that there were about 10 makers of ferrochrome at the close of 1918, some of whom have since dropped out. In addition to the standard ferrochrome, other grades running lower in carbon are produced, including carbon 4 to 6 per cent, 2 to 4 per cent under 2 per cent and carbon free. In summary, it would seem that the ferrochrome outlook depends in a large measure upon the outcome of the tariff question in congress. Peacetime consumption undoubtedly is on the increase, but it is a question whether the imposition of a tariff of the nature proposed would build up the domestic manufacture of the alloy. Most ferrochrome makers oppose the duty on ores, but would welcome a tariff on the alloy. A 60-cent duty on foreign ores would bring the price of foreign ores to at least $1.50 a unit, in view of the prevailing high ocean freight rates. This would throw most of the business to the domestic producers and it is certain that they could not supply the demand for high grade ores. On the other hand, foreign competition in the alloy was pressing during much of 1919 and prospects were for continued keen competition. On Nov. 1 the British home price was £50 a ton for an alloy of 60 per cent chromium, and 4 to 6 per cent carbon, with premiums for chromium above 60 per cent. This was equal, at $4.15 exchange, to about 15½ cents per pound contained, English port, or about 18½ cents, c.i.f. American port, duty paid. In any event, domestic makers experienced a brisk demand for ferrochrome the last of 1919.

No accurate statistics have been published in respect to the production or consumption of ferrovanadium, but it is probable that the rate of production reached 1500 tons annually of contained vanadium in 1918. There were six manufacturers of ferrovanadium toward the close of 1919, one of which probably contributed close to two-thirds of the total production. In 1919 production difficulties reduced the alloy from mineral mined in Peru.

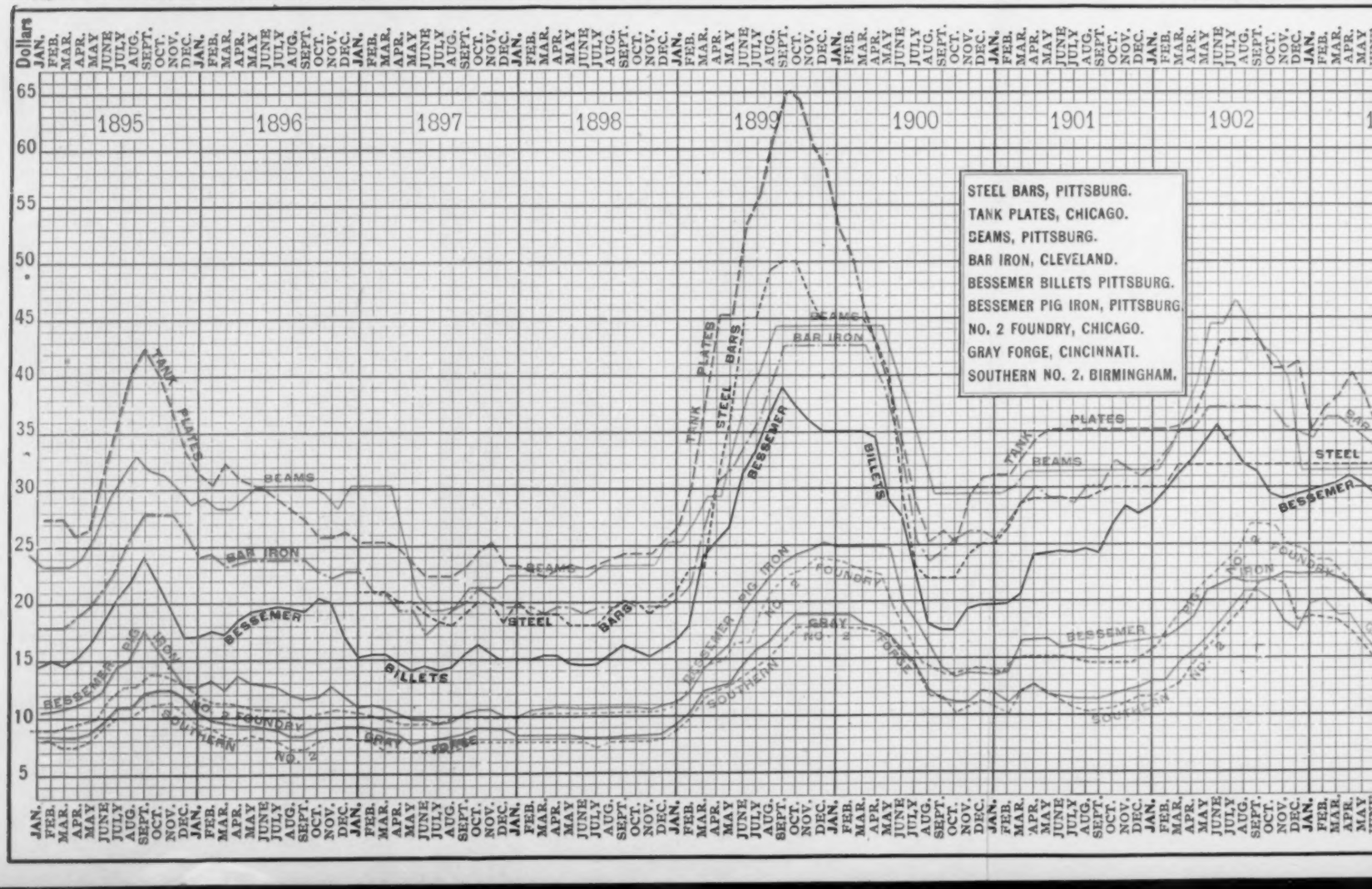
FLUCTUATIONS IN IRON AND STEEL PRICES FOR TWENTY-FIVE YEARS



GOVERNMENT PRICES

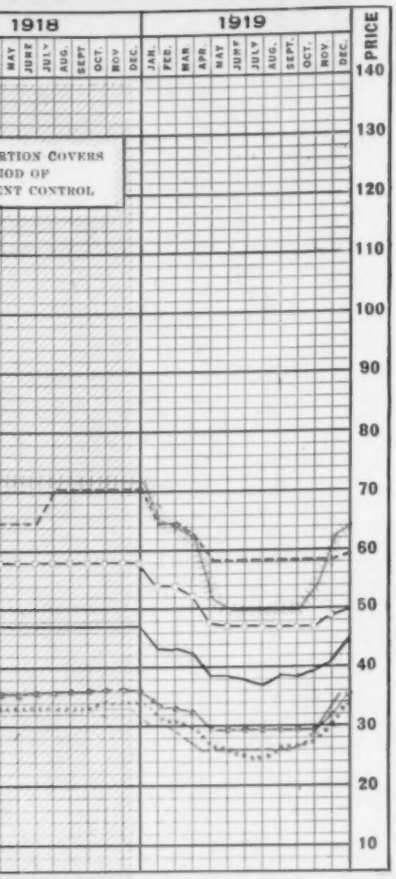
Per Ton with Dates of Announcement

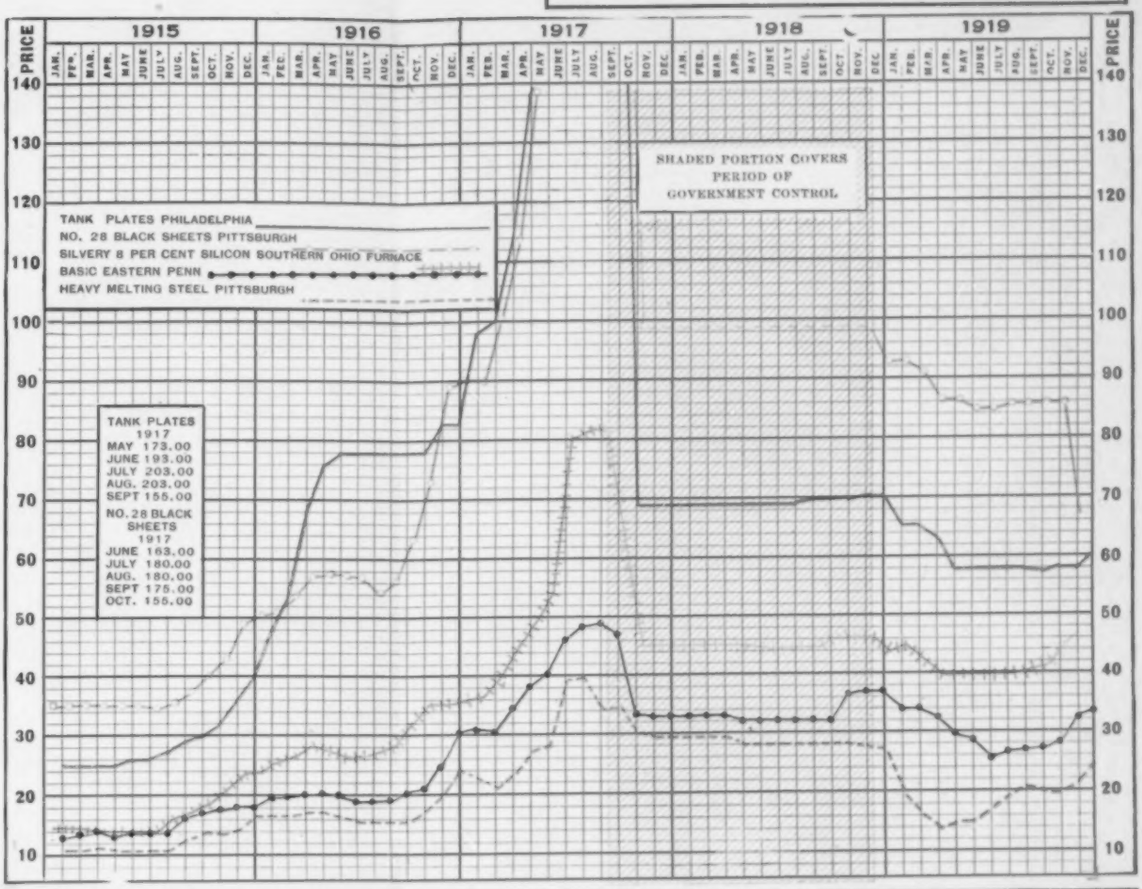
Tank Plates	$65 Pittsburgh, Sept. 24, 1917
Steel Bars	$58 Pittsburgh, Sept. 24, 1917
Beams	$60 Pittsburgh, Sept. 24, 1917
Common Bar Iron	$70 Pittsburgh, Nov. 13, 1917
No. 28 Black Sheets	$100 Pittsburgh, Nov. 5, 1917
Bessemer Billets	$47.50 Pitts. or Young. Oct. 23, 1917
Bessemer Pig Iron	$36.30, Furnace Sept. 24, 1917
	$35.20 April 1, 1918
No. 2 Foundry, Chicago	$33 Furnace, Sept. 24, 1917
	$34 Furnace, Oct. 1, 1918
No. 2 Southern	$33 Furnace, Sept. 24, 1917
	$34 Furnace, Oct. 1, 1918
Basic	$33 Furnace, Sept. 24, 1917
	$32 Furnace, April 1, 1918
	$33 Furnace, Oct. 1, 1918
Heavy Melting Steel	$30 Delivered, Nov. 5, 1917
	$29.00 Delivered, April 1, 1918

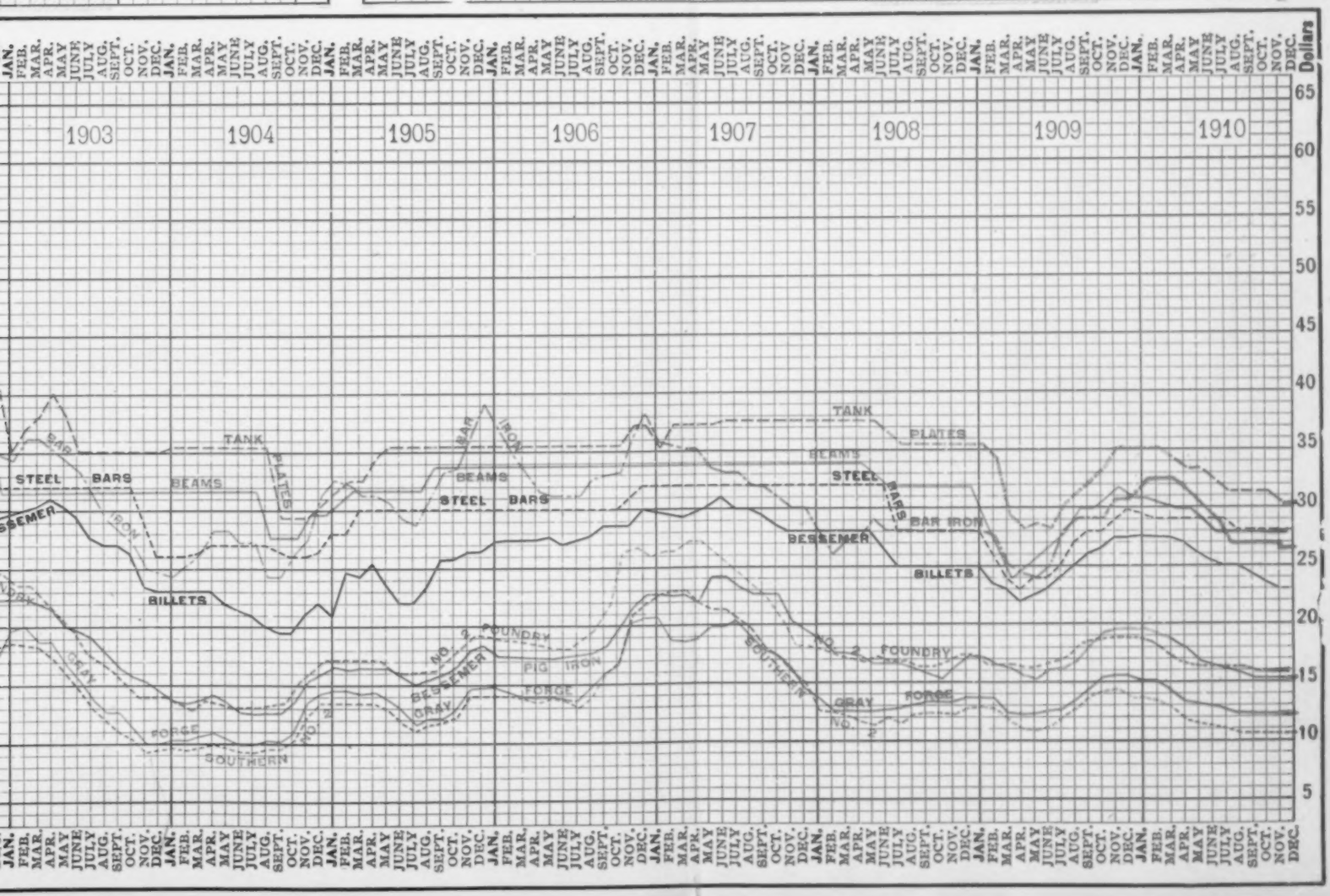


ADE REVIEW

FINISHED PRODUCTS IN NET TONS
PIG IRON AND BILLETS IN GROSS TONS







Labor Problem Demands Cranes

Shortage and Inefficiency of Working Forces Stimulate Adoption of Mechanical-Handling Equipment—Nation-Wide Movement to Modernize Pier and Terminal Plants Soon to Bear Fruit—Government Cranes Small Market Factor

BY B. K. PRICE

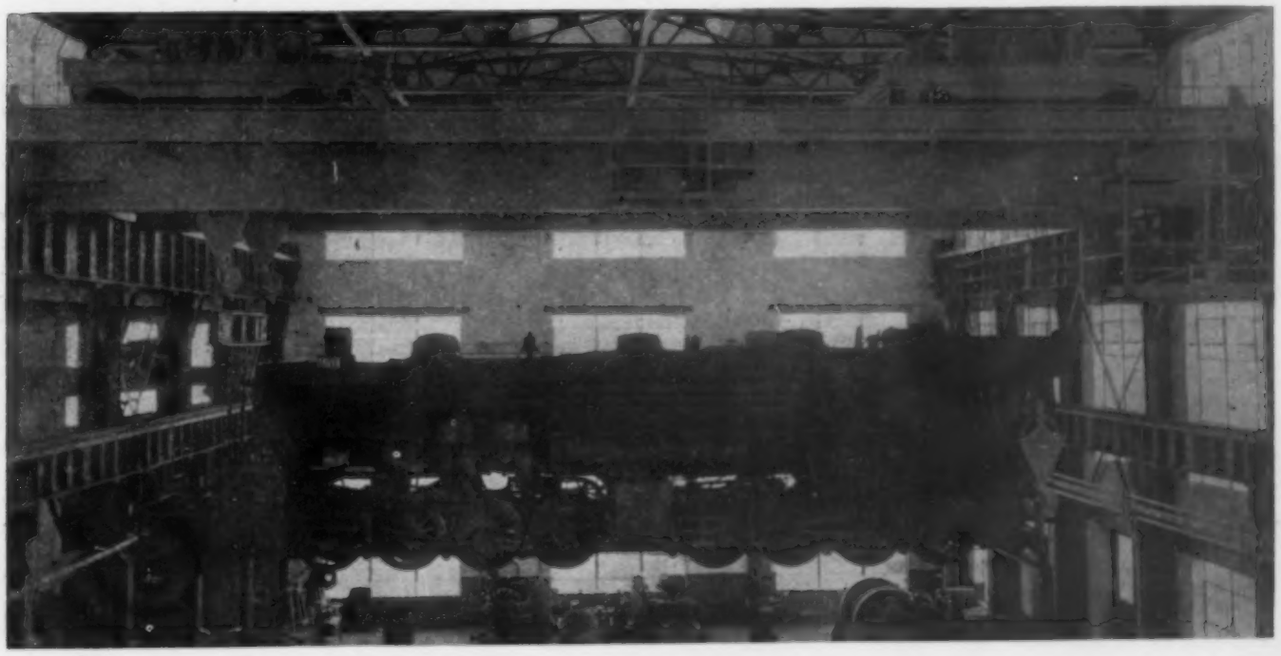
WITH the initial period of reconstruction at a close, the crane industry finds itself in a position that vindicates the more optimistic predictions expressed at the signing of the armistice a little more than a year ago. Practically without exception, all of the larger builders are booked for the comfortable margin of three months, and, at the same time, are being forced to extend their deliveries steadily. At present, one or two companies at least are filled to capacity five to six months ahead.

As a matter of fact, shop operations at no time throughout the year suffered through lack of business. There was a particularly critical time around the latter part of May and the first half of June. But orders began to come in and although several months elapsed before sufficient business was taken to place the industry on a comfortable footing, all trouble in this respect was averted. Since that time, orders on an average practically have tripled over those of the first four to five months, and July stands out as the most active period of the year. In three orders alone, more than 60 cranes were awarded, ranging in capacity from 3 to 250 tons, and the volume of miscellaneous business placed ran well over that total.

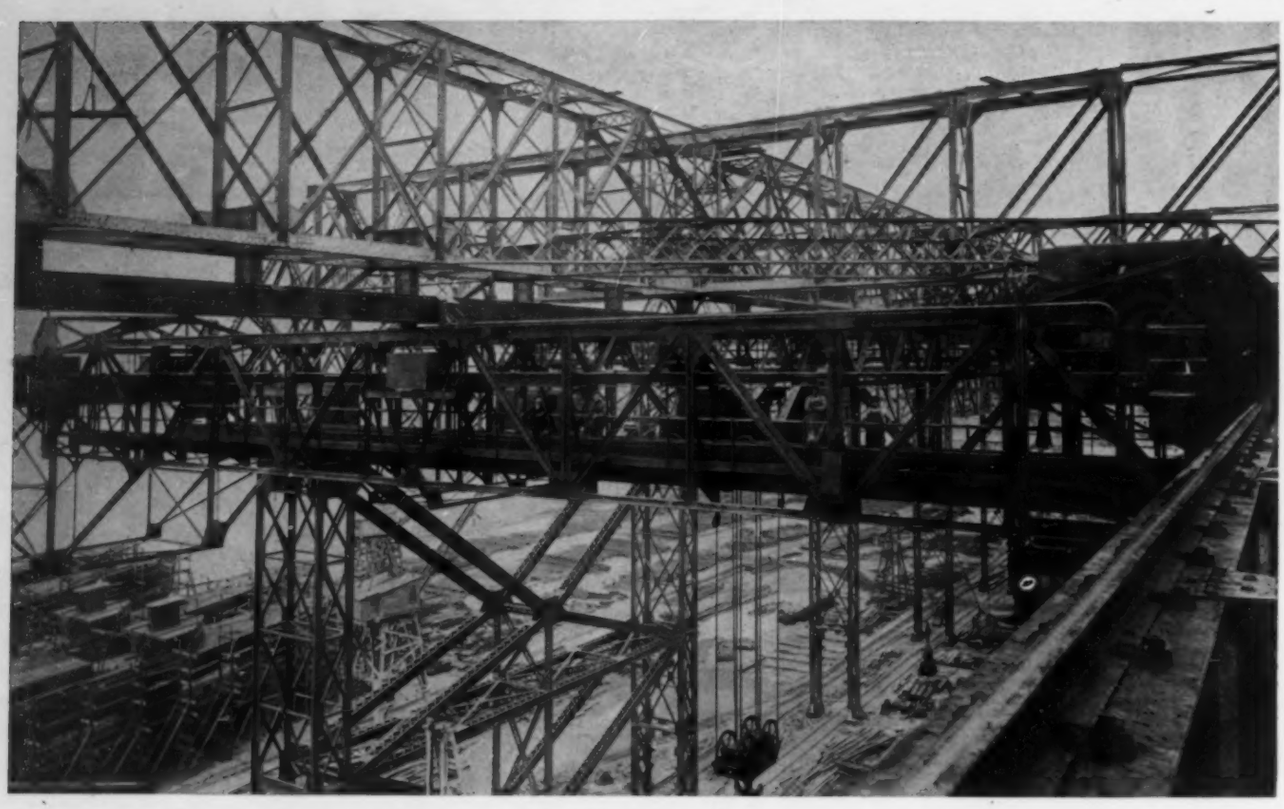
A significant feature of the business awarded in July was that two of the larger orders were for government account. Prior to that time there had been some apprehension as to what effect the overhead cranes in the possession of the government might possibly have upon the market. It was believed in most quarters that there were not a large number of these cranes, and that such machines as were to be disposed of, owing to their nonnegotiable character, could be sold only as appurtenances to the buildings for which they were intended. But there was no absolute assurance that such an assumption was correct. Consequently, the purchases by the government gave strength to the belief that no large number of cranes were held over from wartime orders and that no serious hardship would be worked upon the industry in their disposal. And developments so far have borne out this contention. At present, it is understood, a few cranes still are in the builders' shops, pending shipping instructions and awaiting to be set up; others have been installed, possibly to be sold later as a fixture of the property for which they were intended, while a few have been set up in the government arsenals, although not originally bought for this purpose.

While considerable talk of cancellations was heard in the overhead crane industry at the time hostilities were suspended, the great bulk of the orders on hand were retained. Possibly the most notable instance of cancellation came shortly before the armistice, when orders for a number of cranes for the Alameda, Cal., yard, which was to be built and operated for the government by the Bethlehem Shipbuilding Corp., were countermanded. There were a number of overhead cranes on order, in addition to a list of special cranes. But the work on this equipment had not progressed very far at the time conditions of war called for a revocation of the business.

It was due in a large measure to the work retained from the war period that the shops were able to operate at



250-TON WHITING ELECTRIC TRAVELING CRANE HANDLING 232-TON LOCOMOTIVE IN UNION PACIFIC RAILROAD SHOPS



SHIPWAY CRANE INSTALLATION OF NEWPORT NEWS SHIPBUILDING & DRY DOCK CO., SHOWING 75-TON HEYL & PATTERSON CRANE WORKING IN CONJUNCTION WITH 15-TON UNITS

a normal schedule throughout the early part of the year. Despite the increase in building capacity, there was no indication of a return to the reduced operations which characterized the overhead crane industry early in 1914. Shipments during the first four months or so were the heaviest of any time in 1919, while new business was exceedingly light. In June, however, these shipments fell off abruptly, running along at low ebb for the following two months when a slight increase came in evidence. In November and up until late in December, deliveries fell off slightly, due probably in part to difficulty in obtaining raw materials.

Bookings, following the lull in the early part of the year, increased sharply late in June, and in July, they were at their peak. Following a slight slump in August, new business was well maintained at the lower rate until possibly early in November when they again shrunk slightly. However, even in these latter months there was no semblance of the inactivity which prevailed early in the year. But there was no denying the fact that competition still was keen. On a 5-ton overhead crane for a New England manufacturer around that time there were 22 bids.

While operating costs advanced as the year progressed, the stiffening of prices, nevertheless, gave further evidence of the better tone of the market. According to the most reliable estimates, prices fell off a third during the first eight months, but during the last four months advanced, possibly half the way. Relatively low prices still are to be heard of in a few instances, but these appear to have been brought about by conditions peculiar to the transaction.

The effect of the first year of the reconstruction upon wartime capacity was watched with keenest interest, and at the outset with some apprehension. Estimates at the time the armistice was signed set the gain in the actual capacity of the overhead crane industry at around 50 per cent. This included newly established companies, of which there were at least three of importance, and various plant additions. It did not, however, include companies which departed from their regular line of activity to participate in the abnormal demand for cranes during the war, nor did it take into account the increased operating schedules of the builders. What the increase was, taking these latter elements into consideration, cannot be estimated accurately, although 100 per cent is regarded as a fair guess.

The past 12 months have seen virtually all the companies which diverted their normal production to cranes, again engaged in their normal line of output. The night shifts of the regular builders have been suspended, and certain other curtailments in the working forces have been effected, although the latter for the most part have been negligible. But aside from these changes, the original industry with its increase in physical capacity of about 50 per cent has weathered the past year in excellent shape. At no time, it appears safe to assert, has there been any marked slowing down in normal operations due to a lack of work.

The crane industry, in common with all others, had its labor problems. It shared the difficulties brought about by the marked decrease in labor efficiency, and was not immune from strikes. Little trouble of this latter character, however, was experienced directly, and production, therefore, suffered less than in many other lines.

Demand during the past year covered a wide scope. No particular industry made heavier demands than any other. In a broad sense, it may be said that the iron and steel industry figured principally, but so various are the ramifications of this industry, that such a statement is of little significance. It has developed, though, in accordance with expectations, that the shipbuilding requirements were nothing like those during the war, and that there was relatively little railroad buying. Of a special significance, however, was a growing demand for

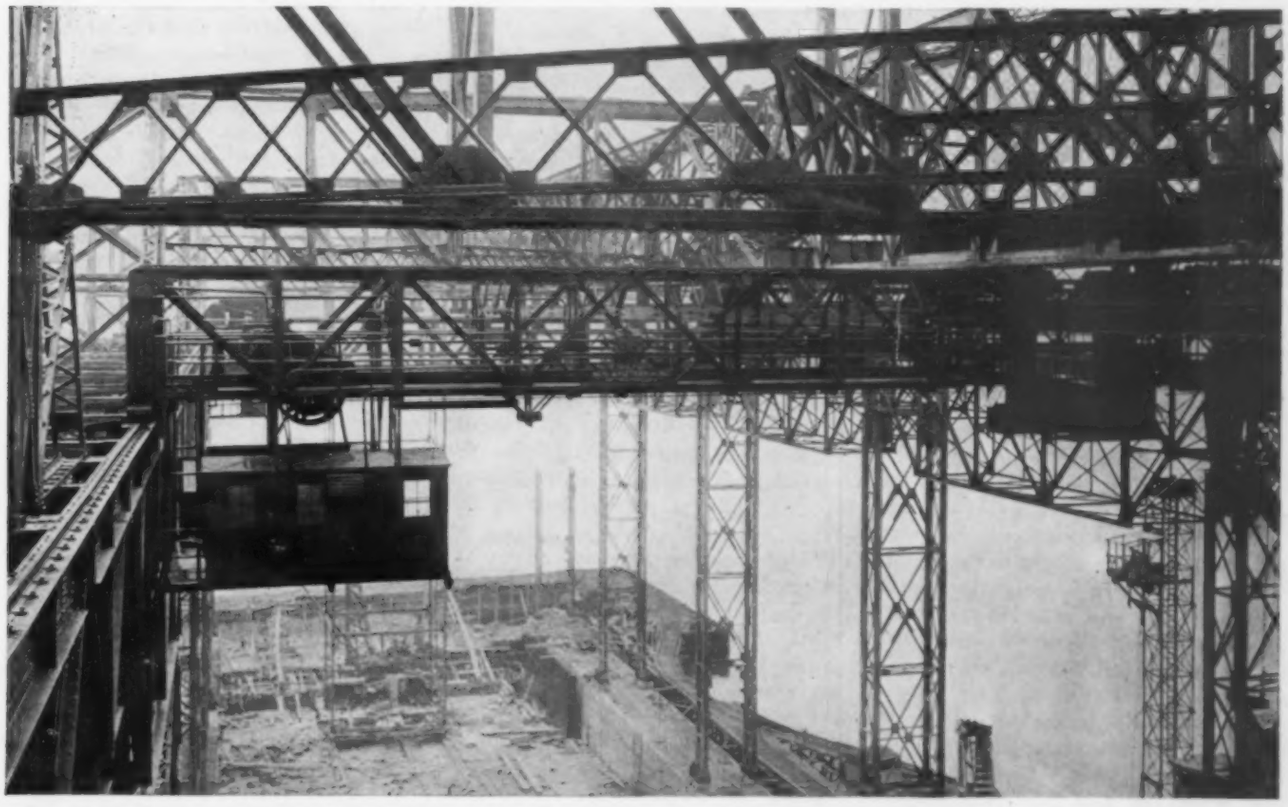
cranes in connection with various pier and terminal projects throughout the country. No large amount of business materialized from this source, but inquiries were noted in increasing number as the year progressed, and there is but little question that this field will offer in the future an outlet for a vast number of cranes. Considerable demand also was noted for coal-handling equipment.

Labor conditions, undoubtedly, had a stimulating influence upon the trading of the past year. In general, it was in common labor that the shortage was felt most, and it was in the ranks of these workmen that the greatest independence was manifested. Consequently, it was not surprising that manufacturers displayed a still greater interest than ever before in cranes and other devices designed primarily to save physical labor. Some interests, emphasizing this influence upon activity, point out that it was not until manufacturers generally became convinced that high wages were here to stay, perhaps indefinitely, and that still shorter working hours might materialize, that buying of any proportions set in. While it would be be difficult to pin such an assumption down to definite facts, it nevertheless, appears to have considerable foundation. It needs to be recalled that early in the year considerable doubt was expressed as to whether war wages would continue and the shorter working hour demands of labor would be granted. The ultimate outcome was that which was generally accepted well before the first six months had elapsed, by which time a marked increase in demand appeared. No doubt in a broader sense the stabilizing effect of this conclusion upon industry as a whole stimulated the market in cranes..

The locomotive crane industry, like that in electric cranes, had considerable business on its books to tide it over the early part of the year. Locomotive crane builders practically without exception were working on government orders at the time the war ended and the great bulk of this business was carried forward. The priority rating which had been followed under government supervision, however, was discarded and deliveries were extended over the first half of the year thus enabling the manufacturers to participate in whatever new business arose. As trading after the first three months picked up considerably, this arrangement proved of great advantage, and it is known that in the case of one builder at least government work was not cleaned up until September.

Considering the large number of cranes to be disposed of by the government, something over 400, the locomotive crane industry enjoyed a good year. Shop operations were maintained at a normal rate throughout the 12 months. Although the market activity during the closing three months or so was not up to that in the summer and late spring bookings as the year closed were of sufficient volume in practically all cases to allow the builders a comfortable margin. However, a number of government cranes still are to be disposed of, and this probably will figure as a market factor for some time to come. The great bulk of these machines originally were to have been disposed of through the railroad administration, but it is understood this plan fell through. In the event the railroads were not supplied with these cranes, and it appears almost certain they were not, crane builders derive satisfaction from the fact that the acknowledged heavy requirements of the former still are to be covered.

A source of some disappointment to locomotive crane builders during the past year has been the lack of export business. Virtually from the very first there was a liberal foreign inquiry, but little actual business developed. Manufacturers attribute this principally to the highly unfavorable exchange rates. They cite as a case in point a number of cranes



ANOTHER VIEW OF THE NEWPORT NEWS SHIPYARD INSTALLATION IN WHICH POSITION AND OPERATION OF THE 15-TON CRANES ARE SHOWN

bid upon for Stockholm, Sweden. Had the exchange rate been normal, American builders would have slightly underbid their nearest competitors, the Germans; as it was the German figures were about a third under the American prices. Other cases are noted.

Locomotive crane capacity now is believed to be almost back to where it was in 1914. During the war the output was increased considerably, possibly 75 per cent, but chiefly by greater operating schedules and the installation in many instances of more modern equipment. As in the overhead crane industry, some companies set aside their usual lines of manufacture for the production of cranes, principally of the smaller sizes. There was little actual plant expansion, and few, if any, new companies were established. Consequently, as the builders have returned to normal schedules and business effort, the capacity of the industry is much the same as before the war.

Early in the year crane builders, together with the manufacturers of conveying equipment of other descriptions, organized the Material Handling Machinery association. It is the aim of this organization to foster achievement in the mechanical movement of material, and in this effort it is doing much to solve many of the present-day industrial problems, such as labor shortage, labor inefficiency and other phases of the low-production, high-cost enigma.

One of the tasks which early devolved upon the association was the instigation of a nation-wide campaign setting forth to manufacturers, railroads, steamship companies, and civic and federal organizations the advantages of machinery in handling material. A growing conception of the economic factor as a result of trying labor experience, was noted during the war, but much still is to be done to focus attention on this subject. At the same time, some of the achievements in mechanical handling proved to be a revelation to equipment manufacturers and industrial engineers generally, and enabled them to better visualize the possibilities of the future. In this connection, a greater tendency has been noted on the part of the crane builders to broaden the scope of their production. This was reflected last summer when more than 17 companies bid upon several special cranes for a proposed municipal pier for Providence, R. I. Prior to the war it is believed that not more than four or five bids would have been received.

It is in the field of transportation that prospects of considerable promise are now being held out to crane builders. Pier and terminal projects expected to be put under way within the next 24 months are estimated to cost at the very least $150,000,000. Practically all of this is to be waterfront development, and in New York City alone, it is estimated that improvements costing approximately $25,000,000 will be undertaken within the coming year. If all of the various plans up for consideration at this port were to be included, the total would total about a half billion dollars.

Exhaustive Studies Made

The interest being taken in the development of more adequate port and terminal facilities is reflected in the exhaustive studies which have been conducted for some time by the department of commerce and the United States port and harbor facilities commission. Of much significance also was the announcement some time ago that Yale university had decided to have a transportation department.

As for the near future there is every reason to assume that the improvement in the crane market during the past half year will at least be maintained. Some interests point rather pessimistically to the presidential election. Nevertheless, whatever depressing influence this may have upon business, in the opinion of many, should be offset by the absence of some of the discouraging conditions which prevailed in the past year. These interests feel confident that some remedial measures will be forthcoming in the matter of foreign exchange rates, thus facilitating export trading, especially in locomotive cranes, and at the same time indirectly stimulating domestic demand.

While there is some question as to what will develop in the way of labor troubles, the fact remains that there will continue to be a shortage of common workmen under circumstances at all normal, and therefore, in all likelihood, a maintenance at least of the present advanced wage schedules which, as in the past, should prove a strengthening factor in the demand for labor-saving equipment. Building activity, too, aside from the present seasonal dullness, shows no signs of tapering off and, all in all, indications of crane business for 1920 appear encouraging.

One of the interesting crane installations to be completed during the past year is at the yard of the Newport News Shipbuilding & Dry Dock Co., Newport News, Va. This company many months ago obtained a contract for the building of two large battle cruisers. To facilitate the construction of these vessels, it started work immediately on several shipbuilding cranes and trestles much larger than any previously built in this country. The trestles as completed cover two shipways 1000 feet in length, each of which has a clear working space about 130 feet wide and 118 feet high. Each shipway is equipped with one 75-ton crane, spanning a full width, and four 15-ton cranes of a length equal to about half the span. The latter are arranged two in each of two runways formed, in conjunction with the outer rails, by a double line of crane girders over the middle of the way.

With a view to the utmost economy wherever practicable, provision was made for the outer ends of the 15-ton cranes to use the same rails as the 75-ton cranes. This arrangement prevents the smaller and larger cranes from passing each other, but as the latter units have to be used only at infrequent intervals, during ship construction, and then principally at the stern ends, this fact causes little or no inconvenience. The material feeding these cranes is brought out of the shops by other travelers which place it alongside a transverse runway. It is then taken by a crane operating on this runway and placed under the shipbuilding trestles, where, ordinarily, it is picked up by the 15-ton shipbuilding cranes. Where necessary, however, the 75-ton cranes can be brought into operation in receiving the material at the point where it is left by the transverse crane. This was made possible by the provision of a 40-foot cantilever trestle extension, upon which the four 15-ton cranes can be run out.

The 75-ton cranes have a span of 132 feet, and speeds, with full load, as follows: Travel, 250 feet per minute; hoist, 16 feet; and trolley, 125 feet. The 15-ton cranes have a span of 64 feet 5 inches, and speeds, with full control, as follows: Travel, 500 feet per minute; hoist, 50 feet; and trolley, 250 feet. The hoist and bridge motion on both sizes of cranes have full magnetic control, the hoist being arranged for dynamic braking for controlling the lowering speed. All cranes are equipped with gravity-operated, manually-released, rail shoes or checks for locking against motion or for emergency purposes.

On the 15-ton cranes, the hoist block is hung by two ropes directly from the drum, there being no sheaves in the hoist block or trolley. The cranes are constructed for a maximum height of hoist of 145 feet. On the 75-ton cranes, a hoist block is carried by ropes passing the equalizer on the trolley.

Annual Market Reviews for 1919

Pig Iron
Ferroalloys
Coke
Semifinished Steel
Plates
Structural Shapes
Merchant Bars
Sheets
Tin Plate
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Wire Products
Wrought Pipe
Cast Iron Pipe
Old Material
Warehouse Trade
Nonferrous Metals
Coal By-Products

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1919 is Year of Disappointment

After a Sluggish First Half During Which Confidence Gradually Was Restored, Industry Runs into Period of Demoralizing Strikes When Market Demanded Full Output—Production of Year Suffers from Upset Operations

AS A SETTLING and squaring about period after four years of dominating war demand, the year of 1919 will fill an important and conspicuous place in the history of the iron and steel industry of the United States. Judged strictly from a trade and operating standpoint, however, it was a disappointment. That this is true speaking broadly has not been due to the factor of obtainable business; in fact the volume of orders that was offered once confidence began to revive was tremendous and far exceeded the ability of producers in many lines to fill it. That in reality makes the failure of the year, to measure up to expectations in results realized, all the more disappointing. For a good part of the year, there was enough demand in certain lines to overreach full capacity. But producers as a whole were not able to obtain anything like 100 per cent outputs. Operating inefficiency and insufficiency, at the time when business was reaching a large volume, in truth, were the outstanding elements of influence of the year. Cause for this is to be found mainly in the labor conditions that prevailed. The iron and steel industry in 1919 faced the most extensive and demoralizing labor troubles that it had known in many years, if ever before.

How far the year fell short as a period of rounded-out prosperity is shown by the record of production. The blast furnaces of the country turned out something like 29,750,000 gross tons of pig iron, exclusive of charcoal iron, as compared with 38,422,175 tons in 1918, 37,863,643 tons in 1917, and 38,844,598 tons in 1916. Steel production is more difficult to estimate because of the suspension of official statistics after the strike of iron and steel workmen broke out in September. During the first eight months of the year approximately 23,950,000 gross tons of ingots were made. At this rate, the full year was destined to yield about 36,000,000 gross tons. Owing to the cessation or slowing down of many plants during the last quarter as the result of the steel and coal strikes, it is doubtful if the year's total will be much over 33,000,000 tons. This compares with 44,462,432 tons in 1918, 45,060,607 tons in 1917 and 42,773,680 tons in 1916. It is apparent that the steel and coal strikes cost the industry in production over the rate previously in effect not less than 2,500,000 to 3,000,000 tons. The potential loss undoubtedly was considerably greater for demand during the final quarter had become so large generally, that an increase in the prestrike rate of operations would have been called for had no obstacles intervened. Indeed full capacity did not seem adequate in various lines of finished material such as bars, sheets, tin plate, wire products and oil and gas pipe.

Mills Adopt Conservative Price Policy

THE year was characterized by the pursuit of very conservative policies toward prices especially on the part of the larger and more influential producers of finished steel. It was felt by these interests that the market should be kept well in hand and that any upward tendencies should be checked because these would be out of step with the efforts of the national government to combat the high cost of living. There is no question, had this restraint not been laid consistently upon the movements of the market that the general level of steel prices would have been much higher especially during the final months when it was clear on all sides that demand was much in excess of supply and still growing. At is was pig iron and semifinished material then were advanced sharply and considerable finished steel business was done well above the general and average level. Furthermore in some cases large premiums were accepted for early shipment. Nevertheless, on the whole, the larger steel producers gave a remarkable exhibition of restraint in subordinating profits to the common national good. In fact steel, that is in commercial form, stands out with remarkable distinction in the present day, as one of the basic commodities, if not the only one, in which prices remain by a wide margin, below the level prevailing at the conclusion of the war. Various finished products now are quotable from $10 to $15 under the figures ruling Dec. 31, 1919.

It has become a question, however, how long this broad-gaged policy of opposing advances being pursued by many producers can be maintained against the rising strength of underlying economic conditions; especially since the loss of output during the final quarter of this year has piled up the deferred obligations of the mills and hence has accentuated the shortage of supplies. It is estimated that steelmakers will carry past Jan. 1 millions of tons of business originally booked for delivery before that date. This in effect constitutes a prior claim on 1920 production. To that extent therefore makers begin the new year under a considerable handicap. This should play a large part in their selling policies and in their ability to accommodate further bookings.

The overlapping effects of government control which officially terminated Jan. 1, were reflected plainly in the iron and steel prices of 1919 especially

during the first half. The two general price reductions on Jan. 1 and March 21, in fact came about, constructively under government supervision, although they represented purely voluntary actions on the part of the producers. The cut of $3 per ton in pig iron and $4 to $6 on steel products to apply to the first quarter which the committee of producers had recommended to the price fixing committee of the war industries board at the conference Dec. 11 was put in effect Jan. 1. This was done by the manufacturers notwithstanding the fact that the price fixing committee because of the expiration of the war industries board Jan. 1, declared it could not officially accept or ratify such a reduction. After some weeks there followed the ill-starred effort of the newly-created industrial board of the department of commerce, to lower the prices of basic commodities by voluntary agreement among producers in various industries. The iron and steel industry having been the first to be called to conference in this movement subscribed to the plan. On March 21, the second cut of the year of $4.25 per ton in pig iron and of $5 to $10 in steel products was put in effect. The controversy over the price of rails between the industrial board and the railroad administration that developed, killed the stabilizing plan but it left the iron and steelmakers committed to a general reduction of prices. The faith was kept by the industry and this reduced level prevailed until in October when the steel strike followed by the coal strike Nov. 1, upset the equilibrium of the market by forcing production far below demand and precipitated advances in pig iron, semifinished material and in some finished lines.

Year's Market in Three Phases

THE market of the year accordingly divides itself into three phases. The first was a part of the period of immediate readjustment that came after the armistice. Despite the general reduction of prices Jan. 1, buyers were timid because of the general uncertainty with regard to the future. This continued for some weeks but just at about the time some signs of improvement were appearing, the movement engineered by the industrial board was launched. This produced the natural effect of holding buying, in suspense and this condition prevailed during the succeeding weeks when the outcome of the plan hung in doubt because of the controversy that developed between the board and various government departments. When the stabilizing price enterprise finally was abandoned in May the air was clarified and for the first time the market was left to work out its own readjustment in accordance with underlying factors. The second stage of the year's market then appearing held sway and was marked by a gradual rising volume of business and increase of production. There was an absence of important price changes in this period. The third and most spectacular phase of the year attended the outbreak of the steel strike on Sept. 22 followed by the coal strike Nov. 1. The effect of a sharp curtailment of mill and furnace operations that resulted, and a growing volume of demand was to precipitate an abrupt advance in numerous lines. Virtually famine conditions developed in the spot market for pig iron and certain other materials. Between Oct. 1 and the year end pig iron prices rose $8 to $10 a ton and semifinished steel almost as much. The uniformity that had prevailed in finished steel prices was destroyed some producers naming advances while others held consistently to the schedules they had adopted months back.

Foreign Trade Greatest in Peace

FOREIGN business in iron and steel in 1919 was the greatest of any peace-year in the history of the industry. Exports during the 10 months up to Nov. 1 totaled 3,813,507 tons. This compared with the totals of 5,375,281 tons, 6,439,067 tons, 6,101,134 tons and 3,532,608 tons in the full calender years of 1918, 1917, 1916 and 1915, respectively which were war years. It also sizes up with 1,549,554 tons in 1914, 2,745,635 tons in 1913 and 2,947,596 tons in 1912, or prewar years. The 1912 figure set the high mark for the industry prior to the war. Imports in the first 10 months of 1919 were 243,858 tons compared with 169,110 tons in 1918, 330,201 tons in 1917, 319,871 tons in 1916, 282,396 tons in 1915, 289,775 tons in 1914, 317,260 tons in 1913, and 225,072 tons in 1912. The 1919 foreign shipments were held back at intervals by various causes such as shortage of vessel space, dock strikes, etc. Toward the close of the year, the shortage of material was a retarding factor of great importance in this trade. Throughout the year the upset exchange situation with the dollar at a premium operated strongly to discourage buying in the markets of the United States and this became more and more a consideration of great weight as the disparity between American and foreign money values grew. Had anything like nominal conditions in foreign trade prevailed in 1918, it is certain that the exports of iron and steel from this country great as they were, would have been tremendous, so extensive and pressing was the demand from overseas.

The movement of iron ore by lake in 1919 fell below that of 1918 by a large margin or by 13,986,270 tons. Shipments of ore by water for the season of 1919 totaled 47,170,462 tons compared with 61,156,732 tons in 1918, and 62,498,901 tons in 1917. The reduced movement of ore was influenced by a strike on the docks at the head of the lake in August, by the steel strike with crippling effect upon blast furnace operations and by the large stocks of ore both on the dock and in furnace yards at the beginning of the season. On Dec. 1, the situation with respect to ore on dock, was virtually unchanged as compared with the previous year. The total then was shown to be 10,454,843 tons against 10,376,509 tons on the corresponding date in 1918.

Average Monthly Prices of Pig Iron, Rolled Products and Old Material in Principal Districts in 1919

Average Monthly Prices of Leading Materials at Pittsburgh

PIG IRON

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Bessemer	$33.60	$33.60	$32.55	$29.35	$29.35	$29.35	$29.35	$29.35	$29.35	$29.35	$32.00	$36.15
Basic	31.40	31.40	30.35	27.15	27.15	27.15	27.15	27.15	27.15	27.15	30.40	34.50
Foundry, No. 2	32.40	32.40	29.85	28.15	28.15	28.15	28.15	28.15	28.15	28.85	33.15	37.25
Malleable	32.90	32.90	31.85	28.65	28.65	28.65	28.65	28.65	28.65	29.15	31.75	37.75
Gray forge	30.40	30.40	29.60	27.15	27.15	27.15	27.15	27.15	27.15	27.65	31.75	35.40

FERROALLOYS

Ferrosilicon (50 per cent) del.	$135.50	$125.00	$125.00	$125.00	$116.00	$80.00	$80.00	$80.00	$83.75	$82.00	$80.00	$82.50
Ferrosilicon (10 per cent) fur.	54.00	54.00	52.95	47.40	45.00	47.40	49.75	49.75	49.75	49.75	54.75	54.75

SEMIFINISHED

Billets, open-hearth	$43.50	$43.50	$42.25	$38.50	$38.50	$38.00	$37.30	$38.50	$39.50	$38.50	$40.90	$44.75
Billets, bessemer	43.50	43.50	42.25	38.50	38.50	38.00	37.30	38.50	39.50	38.50	40.90	44.75
Sheet bars, open-hearth	47.00	47.00	45.75	42.00	42.00	41.50	40.80	42.00	42.00	42.00	45.00	48.00
Sheet bars, bessemer	47.00	47.00	45.75	42.00	42.00	41.50	40.80	42.00	42.00	42.00	45.00	48.00
Wire rods	57.00	57.00	55.75	52.00	52.00	52.00	52.00	52.00	52.00	52.00	56.00	62.00
Strip, hot-rolled	3.80c	3.55c	3.30c	3.24c	3.05c	3.05c	3.10c	3.30c	3.30c	3.30c	3.30c	3.30c
Strip, cold-rolled	6.25c	6.25c	6.10c	5.65c	5.65c	5.65c	5.65c	5.65c	5.65c	5.65c	5.65c	5.65c

COKE

Furnace	$5.85	$4.15	$4.00	$3.80	$3.70	$3.90	$4.00	$4.30	$4.65	$4.15	$5.80	$6.20
Foundry	7.00	5.15	4.80	4.56	4.35	4.70	4.90	5.20	5.90	5.60	6.95	7.15

ROLLED PRODUCTS

Structural shapes, base	2.80c	2.80c	2.7125c	2.45c	2.45c	2.45c	2.45c	2.45c	2.45c	2.45c	2.45c	2.45c
Plates, base	3.00c	3.00c	2.90c	2.65c	2.65c	2.65c	2.65c	2.65c	2.575c	2.65c	2.65c	2.70c
Steel bars, base	2.70c	2.70c	2.60c	2.35c	2.35c	2.35c	2.35c	2.35c	2.35c	2.35c	2.45c	2.50c
Bar iron, base	3.50c	3.50c	3.10c	2.75c	2.75c	2.75c	2.50c	2.50c	2.75c	2.75c	3.15c	3.25c
Shafting, discount	21.00	21.00	22.75	28.00	28.00	28.00	28.00	*3.60c	*3.60c	*3.60c	3.60c	3.60c
Steel pipe ¾ to 3 inch, discount	54.00	54.00	54.875	57.50	57.50	57.50	57.50	57.50	57.50	57.50	57.50	57.50
Standard spikes	3.65c	3.65c	3.575c	3.35c	3.35c	3.35c	3.35c	3.35c	3.35c	3.35c	3.35c	3.35c
Hoops	3.30c	3.30c	3.25c	3.05c	3.05c	3.05c	3.05c	3.05c	3.05c	3.05c	3.05c	3.05c
Bands	3.30c	3.30c	3.25c	3.05c	3.05c	3.05c	3.05c	3.95c	3.05c	3.05c	3.05c	3.05c
Structural rivets	4.40c	4.20c	4.20c	3.70c	3.70c	3.70c	3.70c	3.90c	3.90c	3.90c	4.00c	4.05c
No. 28 black sheets	4.70c	4.70c	4.60c	4.35c	4.35c	4.30c	4.30c	4.35c	4.35c	4.35c	4.35c	4.35c
No. 28 galvanized sheets	6.05c	6.05c	5.95c	5.70c	5.70c	5.65c	5.65c	5.70c	5.70c	5.70c	5.70c	5.70c
No. 10 blue anld. sheets	3.90c	3.90c	3.80c	3.55c	3.55c	3.50c	3.50c	3.55c	3.55c	3.55c	3.55c	3.55c
Wire nails, base	3.50c	3.50c	3.45c	3.25c	3.25c	3.25c	3.25c	3.25c	3.25c	3.25c	3.45c	3.50c
Plain wire, base	3.25c	3.25c	3.20c	3.00c	3.00c	3.00c	3.00c	3.00c	3.00c	3.00c	3.15c	3.25c
Tin plate	$7.35	$7.35	$7.25	$7.00	$7.00	$7.00	$7.00	$7.00	$7.00	$7.00	$7.00	$7.00

*Base price.

OLD MATERIAL

Heavy melting steel	$20.80	$16.00	$14.65	$15.75	$15.45	$17.25	$19.90	$21.25	$20.50	$20.00	$21.90	$24.50
Low phosphorus	29.40	24.25	22.50	22.40	22.00	21.25	23.00	24.00	24.00	24.00	25.75	27.50
No. 1 cast	25.60	21.00	21.00	21.75	21.00	21.00	21.00	24.00	24.50	25.00	28.75	30.50

Average Monthly Prices of Leading Materials at Chicago

PIG IRON

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Lake Superior charcoal	$38.70	$38.70	$38.70	$33.26	$31.72	$31.72	$31.75	$32.75	$32.75	$33.15	$35.50	$41.40
Northern No. 2 foundry	31.00	31.00	29.94	26.75	26.75	26.75	26.75	26.75	26.75	27.55	31.75	38.75
Southern No. 2 foundry	37.25	37.25	36.19	33.00	32.55	30.00	30.80	31.75	31.75	32.25	35.00	40.00
Malleable	31.50	31.50	30.44	27.25	27.25	27.25	27.25	27.25	27.25	28.00	32.25	39.25

ROLLED PRODUCTS

Bar iron	3.13c	2.95c	2.86c	2.58c	2.50c	2.53c	2.62c	2.62c	2.62c	2.68c	2.73c	2.77c
Steel bars	2.97c	2.97c	2.81c	2.62c	2.62c	2.62c	2.62c	2.62c	2.62c	2.62c	2.62c	2.62c
Structurals	3.07c	3.07c	2.89c	2.72c	2.72c	2.72c	2.72c	2.72c	2.72c	2.72c	2.72c	2.72c
Plates	3.27c	3.27c	3.15c	2.92c	2.92c	2.92c	2.92c	2.92c	2.92c	2.89c	2.92c	2.92c
Sheets No. 28 Black	4.97c	4.97c	4.88c	4.62c	4.62c	4.62c	4.62c	4.62c	4.62c	4.62c	4.62c	4.62c

OLD MATERIAL

No. 1 R. R. wrought	$23.30	$16.65	$17.65	$18.50	$17.05	$18.70	$21.20	$23.25	$21.25	$22.00	$26.50	$27.00
Heavy melting steel	19.20	14.90	15.25	16.40	15.40	16.75	19.40	20.75	19.00	18.80	20.65	21.00
Rerolling rails	22.30	15.55	16.30	17.95	17.45	19.25	24.70	29.00	25.40	26.80	31.15	31.75
Car wheels	23.20	21.15	20.00	20.40	20.20	22.00	24.40	25.15	23.50	23.60	28.50	29.75

Average Monthly Prices of Leading Materials in the East

PIG IRON

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Basic, eastern Pennsylvania	$33.90	$33.90	$32.85	$29.65	$28.80	$25.50	$26.50	$27.00	$27.00	$27.90	$33.00	$33.75
No. 2X foundry, Philadelphia	36.15	36.15	35.10	31.90	30.10	29.60	29.50	29.60	29.95	32.00	35.85	40.00
No. 2X Virginia, furnace	35.25	33.00	31.65	28.45	27.50	26.50	26.50	28.25	29.25	30.35	33.40	38.00
Standard low phos., Philadelphia	51.00	51.00	49.90	46.75	45.80	42.25	41.10	40.25	40.25	40.35	43.00	47.50
Standard gray forge, eastern Pa.	33.90	33.90	32.80	29.65	27.65	28.00	28.00	28.35	28.50	29.15	32.25	35.00

ROLLED PRODUCTS

Tank plates, base, Philadelphia	3.245c	3.245c	3.155c	2.895c	2.895c	2.895c	2.895c	2.845c	2.845c	2.895c	2.945c	2.995c
Structural shapes, base, Philadelphia	3.045c	3.045c	2.958c	2.695c	2.695c	2.695c	2.695c	2.695c	2.695c	2.695c	2.695c	2.845c
Steel bars, base, Philadelphia	2.945c	2.945c	2.855c	2.595c	2.595c	2.595c	2.595c	2.595c	2.595c	2.595c	2.675c	2.745c
Bar iron, common, base, Philadelphia	3.745c	3.295c	3.005c	2.595c	2.595c	2.595c	2.595c	2.595c	2.595c	2.745c	2.895c	3.159c
No. 10 blue anl. sheets, Phila.	4.145c	4.145c	4.055c	3.795c	3.795c	3.795c	3.795c	3.795c	3.795c	3.795c	3.945c	4.045c
Open-hearth billets, Philadelphia	$47.50	$47.50	$46.25	$42.50	$42.50	$42.50	$42.50	$42.50	$42.50	$44.00	$46.90	$53.75

OLD MATERIAL (Delivered eastern Pennsylvania)

No. 1 heavy melting steel	$19.60	$15.25	$14.25	$15.85	$15.30	$16.15	$18.85	$19.60	$19.00	$19.55	$20.80	$23.90
No. 1 R. R. wrought	29.80	25.00	24.00	21.50	21.90	22.50	24.70	27.25	27.00	27.00	27.85	30.75
No. 1 heavy cast	28.60	25.00	22.50	22.10	21.50	22.00	23.50	24.90	25.00	25.40	28.00	31.50

Pig Iron Market Breaks Bounds

After Ten Months of Comparative Inactivity Over Which Governmental Supervision Exerts Influence, Open Trading is Restored and Law of Supply and Demand Rules—Coal and Steel Strikes Dissolve Market Apathy

AN ANCHORED pig iron market broke loose from its moorings in the final quarter of 1919. A market grown used to price regulation after a period of 14 months when such practice best served the ends of a country at war, finally shook itself free from the shackles. It took almost ten months to accomplish the change from a situation where prices were established by suggestion to one in which the law of supply and demand was the dominating influence. It took a labor disturbance of great magnitude to bring about the new order or rather the restoration of natural conditions where prices find their true level according to the size of the demand and the supply.

Actually no good reason for the market to move out of the established price groove existed over the first nine and one-half months of the year. Barring the month of June, when melters particularly of the foundry grades, entered the market for their last half requirements, the period was marked by no unusual activity and as far as the steelmaking grades were concerned, trading was moderate almost to the point of listlessness. While production both by the merchant and steel works furnaces, starting with March, was running month by month substantially behind the same months in 1918 and 1917, there always appeared to be enough iron for all requirements. It may be that the ease with which they covered their requirements had lulled consumers into a sense of false security, for in light of what happened in the last two and one-half months of the year, it is plain that most of them were going along with extremely moderate reserve supplies. Production and consumption were running along even when the strike came in September. Since this disturbance involved more common, than skilled labor, blast furnace operations suffered more than did the steel works or finishing mills and the output of iron fell sharply. More than 100 stacks were forced to suspend and while the idleness of more than 50 of these was of only brief duration, the loss of production roughly may be estimated at over 1,000,000 tons. This estimate is arrived at by assuming that the September production, if the strike had not occurred, would have at least equalled that of August, which was 2,742,081 tons and that the output of the furnaces in October also would have been at least as large as that of August.

Actual production in September, instead of matching that of August, fell 261,000 tons behind. In October, the output of the furnaces was 878,000 tons less than that of August. Reference to production figures of other years will disclose that production invariably is on a rising scale from August to October inclusive. In only one year in the past five has the production of September failed to make a gain over that of August and the same is true with reference to October output as compared with September.

Production in these three months in 1918 was 3,378,479 tons in August, 3,413,223 tons in September and 3,482,-393 tons in October, while in 1917, the production for these months was 3,238-970 tons, 3,140,742 tons, and 3,296,280 tons, respectively. It will be observed that the production of these months ran pretty even. If September and October last year each had reached the same total as August, the production for the three months would have been approximately 8,230,-000 tons. The actual production of three months was 7,087,295 tons and the difference, 1,153,000 tons, therefore is the theoretical loss occasioned by the strike. It was this loss that weighed the balance toward scarcity, the realization of which started the wave of buying that sent prices soaring in what might well be termed sensational fashion.

It took the strike to bring to the surface the extremely strong statistical position of the market. The actual interruption to production soon found reflection in the size of the shipments to melters and when the latter went into the open market for tonnages to replace those which had failed them, they found they were not obtainable except upon a competitive basis. The foundrymen felt the pinch of supply first, for they were least affected by the walkout of Sept. 22, and the first to recover from its effects. The disturbance came when the makers of gray iron castings, notably the radiator and sanitary ware interests were crowded to capacity and beyond with orders, when the malleable foundries also were heavily booked and when the foundry industry as a whole was in the most prosperous condition in years. The only branch

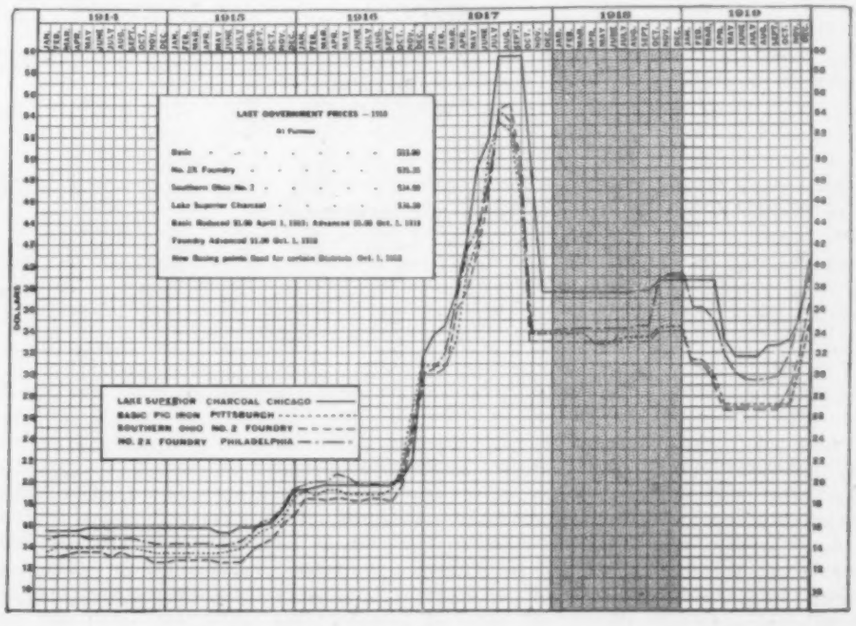


CHART OF AVERAGE MONTHLY PRICES OF FOUR LEADING GRADES OF PIG IRON 1914-1919. SHADED PORTION SHOWS PERIOD OF GOVERNMENT CONTROL

of the industry below normal was that engaged on steel castings, which was feeling the lack of railroad business.

The stove, radiator and sanitary manufacturers striving to make up production lost during the war, when they were obliged largely to abandon regular lines, were not disposed agricultural implement industry also sought supplies.

If there was one section of the country which suffered the pinch in the supply more than others, it was the midddle west. In this region, melters draw their iron supplies largely from furnaces along the lake burgh market, as an example, for shipment into Michigan and other places carrying freight rates which in normal time would have barred such shipment. When the supply of these grades proved insufficient, huge tonnages of the steelmaking grades were bought for foundry needs.

Prices of Representative Grades of Pig Iron

1914-1919

BASIC, PITTSBURGH

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1919	$31.40	$31.40	$30.35	$27.15	$27.15	$27.15	$27.15	$27.15	$27.15	$27.15	$30.40	$34.50
1918	33.95	33.95	33.95	32.95	32.95	33.20	33.40	33.40	33.40	34.40	34.40	34.40
1917	30.95	30.95	32.85	39.20	42.15	50.20	53.20	52.75	43.95	33.95	33.95	33.95
1916	19.20	18.77	19.20	19.20	18.95	18.95	18.95	18.95	19.08	20.83	25.95	30.95
1915	13.45	13.45	13.45	13.45	13.45	13.54	13.83	14.89	15.65	15.95	16.70	18.55
1914	13.42	14.09	13.96	13.90	13.90	13.90	13.90	13.90	13.90	13.75	13.45	13.45

BESSEMER, PITTSBURGH

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1919	$33.60	$33.60	$32.55	$29.35	$29.35	$29.35	$29.35	$29.35	$29.35	$29.35	$32.00	$36.25
1918	37.25	37.25	37.25	36.15	36.15	36.40	36.60	36.60	36.60	36.60	36.60	36.60
1917	35.95	35.95	37.45	42.20	44.95	55.20	57.95	55.55	48.27	37.25	37.25	37.25
1916	21.32	21.45	21.55	21.95	21.95	21.95	21.95	21.95	22.20	24.33	30.35	35.95
1915	14.70	14.63	14.55	14.55	14.55	14.58	14.82	15.89	16.80	16.95	17.45	19.70
1914	15.00	15.09	15.15	14.90	14.90	14.90	14.90	14.90	14.90	14.85	14.70	14.70

NO. 2X FOUNDRY, PHILADELPHIA

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1919	$36.15	$36.15	$35.10	$31.90	$30.10	$29.60	$29.50	$29.60	$29.95	$32.00	$35.85	$40.00
1918	34.25	34.25	34.25	34.25	34.25	34.25	34.50	34.50	34.50	38.85	39.15	39.15
1917	30.50	31.75	36.90	41.75	43.35	47.50	54.35	53.40	47.80	34.00	34.00	34.00
1916	19.75	20.00	20.00	20.75	20.50	19.75	19.75	19.75	19.75	20.50	25.25	30.00
1915	14.25	14.25	14.25	14.25	14.00	14.25	14.50	15.25	16.25	16.50	17.50	19.25
1914	14.75	15.00	15.00	15.00	14.75	14.75	14.75	14.75	14.75	14.50	14.25	14.25

SOUTHERN OHIO NO. 2 FOUNDRY, IRONTON

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1919	$31.00	$31.00	$29.95	$26.75	$26.75	$26.75	$26.75	$26.75	$26.75	$28.80	$31.75	$36.50
1918	33.00	33.00	33.00	33.00	33.00	33.00	33.00	33.00	33.00	34.00	34.00	34.00
1917	30.00	30.75	35.80	37.75	41.20	47.50	54.50	55.00	49.25	33.00	33.00	33.00
1916	18.30	18.50	18.30	18.50	18.50	18.15	18.44	18.40	18.13	19.38	24.00	30.00
1915	12.75	12.75	12.75	12.75	12.56	12.50	12.60	13.63	14.20	14.88	16.13	17.00
1914	13.00	13.00	13.25	13.50	13.50	13.50	13.00	13.50	13.00	13.00	12.63	12.63

LAKE SUPERIOR CHARCOAL IRON, CHICAGO

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1919	$38.70	$38.70	$38.70	$33.25	$31.75	$31.75	$31.75	$32.75	$32.75	$33.15	$35.50	$40.75
1918	37.50	37.50	37.50	37.50	37.50	37.50	37.70	37.70	37.70	38.70	38.70	38.70
1917	33.75	34.50	37.55	42.25	49.25	51.80	59.50	59.50	59.50	48.50	37.50	37.50
1916	19.25	19.50	19.75	19.75	19.75	19.75	19.75	19.75	19.75	20.35	21.95	31.75
1915	15.75	15.75	15.75	15.75	15.25	15.25	15.75	15.75	15.95	16.25	17.50	19.25
1914	15.50	15.50	15.50	15.50	15.75	15.75	15.75	15.75	15.75	15.75	15.75	15.75

STANDARD LOW PHOSPHORUS, PHILADELPHIA

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1919	$51.00	$51.00	$49.90	$46.75	$45.80	$42.25	$41.10	$40.25	$40.25	$40.35	$43.00	$47.50
1918	55.50	55.50	55.50	55.50	55.50	55.50	56.00	56.00	56.00	57.00	57.00	57.00
1917	54.50	57.50	66.70	75.50	77.00	85.00	92.50	92.50	82.00	55.50	55.50	55.50
1916	54.50	57.50	66.70	75.50	34.00	34.00	33.00	33.00	34.00	40.00	46.00	55.00
1915	19.00	19.00	20.00	20.00	20.00	20.50	21.50	23.50	24.50	28.00	30.00	32.00
1914	21.00	21.00	21.00	21.00	21.00	20.50	20.50	21.00	21.00	21.00	19.00	19.00

BASIC EASTERN PENNSYLVANIA

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1919	$33.90	$33.90	$32.85	$29.65	$28.80	$25.50	$26.50	$27.00	$27.00	$27.90	$33.00	$34.00
1918	33.90	33.90	33.90	32.90	32.90	32.90	32.90	32.90	32.90	36.60	36.90	36.90
1917	30.15	30.50	33.80	38.25	40.80	46.40	50.75	51.00	46.50	33.50	33.50	33.50
1916	19.50	19.50	20.00	20.50	20.00	19.25	19.00	19.25	20.00	21.00	25.50	30.50
1915	13.50	13.75	14.00	13.25	13.50	13.50	13.75	15.25	17.25	17.50	17.75	18.00
1914	14.00	14.25	14.25	14.25	14.00	14.00	14.00	14.00	14.00	14.00	13.50	13.50

VIRGINIA NO. 2X FURNACE

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1919	$35.25	$33.00	$31.65	$28.45	$27.50	$26.50	$26.50	$28.25	$29.25	$30.35	$33.40	$38.00
1918	33.50	33.50	33.50	33.50	33.50	33.50	33.50	33.50	33.50	37.50	38.00	38.00
1917	26.50	28.25	34.25	38.40	41.00	46.50	52.25	51.90	46.50	33.50	33.50	33.50
1916	17.25	18.00	18.25	18.50	18.50	18.50	18.50	18.50	17.50	18.50	23.75	27.00
1915	12.50	12.50	12.50	12.50	12.50	12.50	12.50	13.00	13.50	14.00	15.50	17.00
1914	12.75	12.75	12.75	12.75	12.50	12.50	12.50	12.50	12.50	12.50	12.50	12.50

SOUTHERN NO. 2, BIRMINGHAM

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1919	$31.00	$31.00	$30.00	$26.75	$26.25	$25.25	$25.00	$26.75	$26.75	$27.45	$30.05	$35.25
1918	33.50	33.50	33.50	33.50	33.50	33.50	33.50	33.50	33.50	35.25	35.25	35.25
1917	23.00	24.50	28.00	35.80	35.75	35.75	46.00	48.00	43.50	33.50	33.50	33.50
1916	14.50	14.65	15.00	15.00	15.00	14.45	14.00	13.60	14.40	15.15	19.60	23.00
1915	9.50	9.50	9.40	9.35	9.75	9.55	9.60	11.00	11.30	11.75	13.15	14.20
1914	10.50	10.50	10.60	10.50	10.50	10.45	10.05	10.00	10.00	10.00	9.90	9.50

to let lack of raw material supplies add to a curtailment of production arising from the lack of sufficient labor. Large and pressing orders were on the books of the machinery and machine tool builders. The automotive industry had embarked upon an ambitious production schedule, and strove to secure iron supplies for gray iron and malleable castings. Malleable castings makers serving the fronts. From Buffalo west to Chicago on a straight line, furnaces went down with the strike and did not again go in blast until long after those in other sections were in operation. After cleaning up stocks of iron at their sources of supplies, melters still found themselves short and had to seek fields anew. Thousands of tons of foundry and malleable iron were sold in the Pittsburgh market, as an example, for shipment into Michigan and other places carrying freight rates which in normal time would have barred such shipment. When the supply of these grades proved insufficient, huge tonnages of the steelmaking grades were bought for foundry needs.

This was the beginning. The condition in which the middle western melters found themselves, so those in other parts of the country later found themselves. The buying did not end with merely the purchase of sufficient supplies to tide over the period of shortage; it continued until practically all of the foundry pig iron that will be produced over the first six months of this year had

been pledged. This condition was reached before the first of December. Thereafter, merchant furnaces were not much interested in new inquiries except at prices that would safeguard them against the possibility of higher labor and material costs. Commitments against merchant production of the steelmaking grades were smaller and less extensive. But much 1919 business remains on the books of makers as an obligation against future production, carried forward either because of the inability of the consumer to use it or the maker to produce it on account of the strike.

The problem immediately before the industry is less one of capacity than it is one of labor. Pig iron productive capacity, present and immediately prospective, is sufficient to care for the requirements of the country even if they should be above normal, as was the case in 1918 and 1917. It is well known that pig iron production is largely in the hands of common labor. There was no oversupply of this class of labor when the recent strike began and it now is positively short, not only because many men have gone into other lines of endeavor, but because so many of the foreign workmen have felt the lure of a visit home to see the effects of war on the old countries.

This condition is not confined to the blast furnaces alone, but extends into the production of ore, coke and limestone. With both the steel manufacturers and the foundries heavily crowded with business, the outlook for 1920 could not be much better from the standpoint of business, but a full realization is endangered by the lack of sufficient labor, and because labor knowing its strength, is not inclined, as in the days of old, to be content with the assurance of steady employment.

If 1919 had begun on June 1, instead of Jan. 1, it might have been rated as a fairly good year in pig iron. It is doubtful if the industry ever experienced a quieter period than the first five months and this notwithstanding some large and persistent demands from the makers of stoves, radiators and sanitary ware, who were quick to make a start toward getting back to normal peace time conditions. The steel industry, however, suffered severely from the lack of confidence on the part of buyers in the prices which ruled over the first three months. This came about as a result of the meeting in December, 1918, between the price committee of the American Iron & Steel institute and the expiring war industries board.

Although these prices were lower than those of the final quarter of 1918, they lacked governmental approval and believing they could not be maintained, buyers of steel confined their purchases to actual needs. This entire period was marked not only by dullness, but by a constant blowing out of furnaces.

Uncertainty in First Half

The first half of the year not only included the price fixing as of Jan. 1, which caused much confusion among pig iron producers as to whether the prices applied to old contracts or merely referred to business taken after that date, but also an attempt in March to speed up the restoration of normal industrial conditions. This was engineered by the specially-created industrial board.

The iron and steel industry acquiesced in the suggestion of the board for a cut in prices. Pig iron prices which were reduced $3 on Jan. 1, were cut $4.25 more at the March conference, a total of $7.25 from the prices of the last quarter of 1918. This brought basic to $25.75 bessemer to $27.95, and No. 2 foundry (1.75 to 2.25 silicon) to $26.75, furnace. More confusion arose as to whether these prices applied to old contracts or were to rule on business taken after March 21. It was settled, as was the case in January by some producers revising their contracts to the suggested levels, and in time, practically all did likewise. With the passing of the industrial trade board in May business became more reassured.

While melters of foundry iron bought freely in June in all centers, the steelmaking grades still were feeling the weight of the big supplies accumulated through the inactivity of the first half. Steel work's requirements largely were met from these supplies pieced out by occasional purchases. Foundry iron remained in good demand over the third quarter but basic and bessemer grades were largely neglected. Then came the strike with its sharp reduction of output and the frantic buying by melters, caught short. Foundry grades were cleaned up with great rapidity and a little later much of the remaining supplies of basic and bessemer were taken up largely for foundry use. With the wild rush of demand, a runaway market followed.

Comparatively little sheet steelmaking iron was available when this demand came, for the strike had stopped more steel plant, than merchant, blast furnaces. Recovery from the strike was a little more rapid in the steel works and finishing mills than with the blast furnaces, however, one of the early developments was the appearance, in the open market, of several of the Steel corporation subsidiaries for steelmaking iron. Total purchases by these companies, chiefly the Carnegie Steel Co., the American Bridge Co., for its Pencoyd works, and the American Steel & Wire Co., for some of its Pittsburgh district plants, amounted to more than 100,000 tons, of which about 25,000 tons were bessemer and the remainder basic. These purchases were made generally at the then market prices, or $27.95, furnace for bessemer and $25.75, furnace, for basic. Some of the latter grade, however, was sold for $25.60, furnace.

Dawn of a new year finds No. 2 foundry (1.75 to 2.25 silicon) commanding $38, Buffalo furnaces; $36, valley furnace, or $37.40, delivered Pittsburgh; $35, Birmingham; $36.75, southern Ohio, and $39 to $40, Chicago. In the last No. 2 (2.25 to 2.75 silicon) is bringing $39 to $40, eastern Pennsylvania furnace and Virginia No. 2, $38.25. At the outbreak of the strike, the market was not over $26.75, furnace, for No. 2 foundry in any part of the country and during the unsettled conditions of the first half this grade sold as low as $23.70, Birmingham. Equalization of freights in the struggle for business over the middle of the year resulted in northern iron touching $25 or lower on a good deal of tonnage. Present prices, therefore represent a recovery from the low of 1919 of $10 to $13 per ton.

In the past few weeks, $34 furnace, has been established. While the price of $26.75, furnace, brought about by the industrial board was the basis of much of the direct business done between March 21, and the outbreak of the strike, it does not measure the low mark of the year. The Inland Steel Co. early in March disposed of 25,000 tons at $25, furnace, and several steel plants were able to cover their requirements for the last half of 1919 from a furnace which went into blast in July at 25 to 50 cents below the scheduled figure. On direct business, as distinct from resales, the low point appears to be $25.

Adherence to the industrial board price of $27.95, furnace, for standard bessemer was fairly rigid and that figure may be regarded as the minimum of the year apart from resale business. The present price of $35, furnace measures a recovery of $7.05 a ton, the least appreciation in any of the three leading grades. Malleable iron recently has sold at $26.25 from valley furnaces, or $9 above the low point of the year.

Bee-Hive Coke Losing Ground

Loss of Open Oven Output in 1919 is Placed at 10,000,000 Tons—Connellsville Yield Smallest Since 1910—Sliding Scale Contracts Favored By Consumers—Labor Factor Has Dominating Influence on Market

PRODUCTION of coke in beehive ovens gave an additiona ground in 1919 in the race with the newer by-product method. Latest figures available on the output of the beehive ovens of the country for 1919 show a loss compared with 1918 of about 10,000,000 tons.

Government figures for 1918 show that the total production of coke, both beehive and by-product, was 56,670,000 net tons, of which 30,406,000 tons, or 54 per cent, were produced in beehive ovens and 26,264,000 tons or 46 per cent, in by-product plants. In 1917, total production was 55,606,000 tons, of which the beehive ovens contributed about 60 per cent and the by-product plants 40 per cent. Demands for coke were so much less last year that the output of both types of ovens was much smaller than in 1918. In view of the fact that 1919 saw a substantial gain in by-product capacity and a decline in the number of beehive ovens, the prediction that 1919 figures will show both classes of coke on about an even footing in the matter of production appears safe.

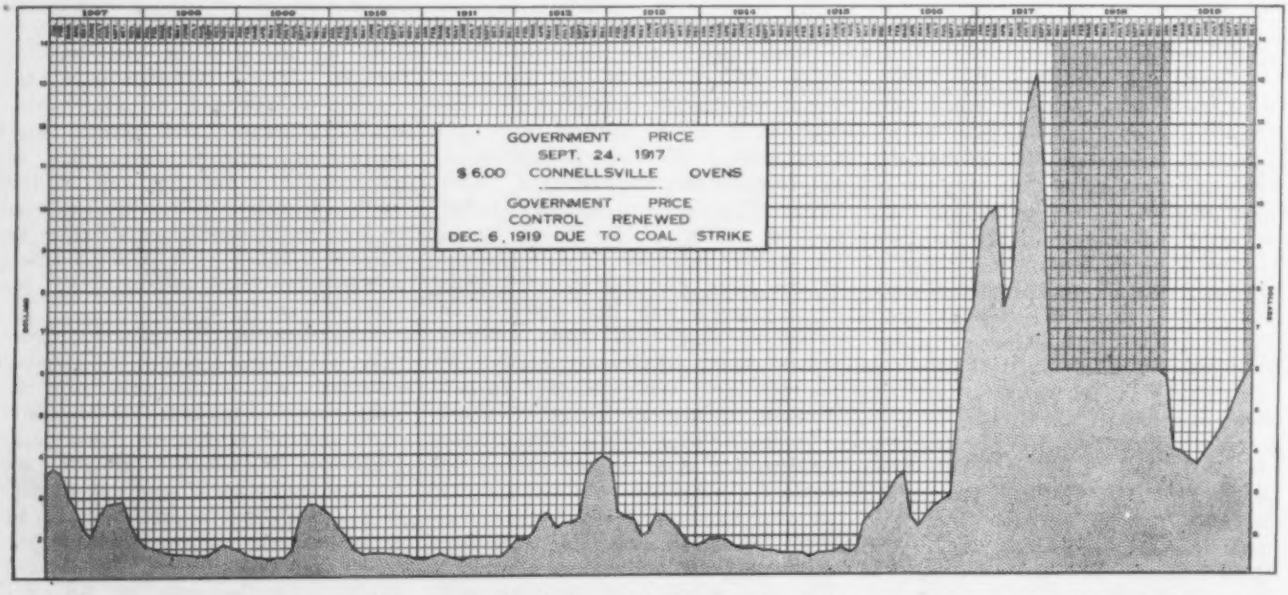
In the Connellsville regions the past year witnessed the abandonment of approximately 1000 ovens. At the end of 1918, the district had 37,061 ovens, while at the end of last year 36,078 remained which were capable of making coke. On the other hand, the middle of 1919 saw the starting of the by-product plant of the Jones & Laughlin Steel Co., consisting of four batteries of 60 ovens each, with a rated annual capacity of 950,000 tons of coke, while the Carnegie Steel Co., which ended 1918 with 10 batteries of 64 ovens each at its Clairton, Pa. plant, completed and had in operation in 1919, two additional batteries of the same number of ovens each, making a total of 784 ovens. Altogether, more than 11,000 by-product ovens are built or are being built in the country, with a capacity in excess of 41,000,000 tons of coke annually.

Labor Unrest Hinders Output

If it had not been for the labor disturbances of the last quarter of the year, there is no doubt that by-product output would have exceeded that by the beehive ovens. The steel companies operate about two-thirds of the by-product ovens of the country and the walkout of the iron and steel workmen on Sept. 22, affected the operation of these plants in common with the other departments. Production also was affected by the coal strike, for while at the outbreak of this trouble enough coal was stocked to permit of normal operation for a month, difficulties in "picking up" these supplies and the fact that coal was denied these plants from the outbreak of the trouble made full operation difficult and in some cases impossible. Indeed, the Bethlehem Steel Co., before the strike was three weeks old was obliged to appeal to Washington to secure enough coal to keep its ovens at South Bethlehem Pa., warm.

Not since 1910, has the Connellsville production been so small as in the year just closed. For the first 11 months of the year, the district produced and shipped 9,372,204 tons. The restrictions imposed upon beehive ovens in the effort to bring up the supply of coal for essential industries indicated less of an output for the last month of the year than for November, when it was 1,183,759 tons and the total yield of the region for the year, therefore, can be estimated at approximately 10,250,000 tons. In 1910, the output was 10,700,222 tons, but that was a year of depression, following the financial panic of the year before. In the four years from 1915 to 1919, inclusive, the region averaged about 18,000,000 tons annually.

Dependence upon beehive oven coke slowly but steadily is narrowing to the merchant blast furnaces. New England, with its numerous foundries, no longer uses much, if, indeed, any beehive coke, for between the New England Gas & Coke Co., with a potential annual output of 400,000



PRICES AT OVENS OF CONNELLSVILLE FURNACE COKE 1907-1919. SHADED PORTION SHOWS PERIOD OF GOVERNMENT CONTROL

tons, the Providence Gas Co., which can produce 172,800 tons a year, and the Seaboard By-Product Co., Jersey, N. J., having capacity for 842,000 tons yearly, the requirements of that section are well provided for. Since the prices of that section for coke are based upon the Connellsville price, plus the freight, the beehive coke is no cheaper and consumers also have the advantage of a more accessible supply, with reduced danger of delays in transit such as in the past were experienced in the longer haul from western Pennsylvania.

Marketwise, coke has followed closely in the wake of the demand for pig iron. Over the first five months of 1919, pig iron demands were moderate in the extreme and since this condition was reflected in the blowing out of furnaces, it was necessary that the output of coke should be curtailed. No one, however, yet has devised a way by which production of coke, at least that of the beehive character, can be cut off as rapidly as the demand sometimes declines. This is because coke for blast furnace or smelter use must be burned 48 hours and that for the foundries 72 hours to give satisfactory results. On the other hand, a decision on the part of operators of furnaces, smelters or cupolas to suspend sometimes is a matter of a few minutes. Coke usually is in process of manufacture while the order is on the way to the producer to hold up shipment. Accumulations up to June, therefore, were unavoidable until the furnaces began to develop stable operations and the coke market showed little strength until requirements could be gaged.

This condition did not develop until about the first of June. Prior to that, from the first of the year, the tendency of prices in the main was downward. Although the fuel administration did not cease to function until Feb. 1, and the government maximum coke prices nominally were supposed to remain in force until that date, the market began to give way before January was half gone. Consumers, who were somewhat short of supplies when the year opened, soon began to get heavy offerings, for cancellation of war contracts with copper and nickel smelters began to roll in and since the anticipated rush of iron and steel orders failed to materialize these interests found their needs of coke less extensive and also less urgent.

Spot furnace Connellsville coke, which was supposed to have carried a fixed price of $6, ovens, in January, actually averaged $5.85 for the month. The cut of $3 a ton in pig iron suggested at the final meeting of the price committee of the American Iron and Steel institute and the war industries board in Washington in December, 1918, was accepted after the turn of 1919 by the pig iron makers and then came agitation for a revision in the price of coke contracts. Contracts were entered into late in 1918 for coke supplies for the first half of last year. Some of these specified the maximum government price of $6, ovens, for Connellsville furnace coke and $7 for Connellsville foundry coke for the life of the contracts, while others were made on an understanding that a new agreement should be made with the passing of government control.

Fixed Price Contracts Revised

Some opposition developed on the part of coke producers to a revision of the price in the fixed-price contracts, but eventually they saw the wisdom of this course and a cut was made to $5.50, $5 and even to $4.50, as in the meanwhile, the spot market was showing extreme weakness because of the blowing out of blast furnaces and the throwing on the market of much rejected coke. In February, the spot price for Connellsville furnace coke fell to $4.00 and declined further in the succeeding three months, with the attendant effect upon the markets of the country, which are guided to a large extent by the Connellsville base. Foundry coke, which held up to $7, the government price throughout January, also weakened and declined steadily, reaching the low point during the month of May.

Just as June proved the turning point in the iron and steel markets, so it proved in the coke market, which benefited not only from the improved demand, but also from the fact that production was down to a point where it no longer exceeded consumption. Contracting for last half supplies was on a fairly heavy scale in June, with sliding scale agreements popular with the blast furnaces using Connellsville coke, though some elected fixed price arrangements. The latter form also was common in contracts for foundry fuel, both beehive and by-product. Fixed price furnace coke contracts generally were at $4.25 to $4.50, ovens, while sliding scale contracts called for ratios of 6¼ and 6 to 1, on the price of basic iron at valley furnace. Until basic iron moved up in price late in the year, coke under these contracts moved at from $4.12 to $4.28.

The November average price for valley basic iron was about $30, and the sliding scale contracts, therefore carried a price of $4.80 to $5, ovens. The market showed a good deal of firmness, beginning with June and running through to the outbreak of the steel plant strike. Strike of the railroad shopmen in the summer had checked the movement of coal from some sections to the west and brought big demand into the Connellsville and other regions, which together with the development of some big export coal sales at high prices gave strength to the coke market by making it possible for the beehive operators to ship coal instead of coke. Another strengthening influence was the development in August of a car shortage in western Pennsylvania, something quite unusual for that time of the year.

So many blast furnaces went down as a result of the steel plant walkout, that the demand for furnace coke vanished almost overnight and

Connellsville, Virginia and West Virginia Coke Prices

AVERAGE MONTHLY PRICES FOR YEAR 1919

	Wise County		Pocahontas		New River		Connellsville	
	Furnace	Foundry	Furnace	Foundry	Furnace	Foundry	Furnace	Foundry
January	$7.25	$8.25	$8.00	$8.00	$8.00	$8.00	$5.85	$6.75
February	7.25	8.25	8.00	8.00	8.00	8.00	4.40	5.50
March	6.65	7.50	7.15	7.25	7.90	8.00	4.30	5.05
April	6.00	6.70	6.25	7.00	7.70	8.00	4.05	4.95
May	5.25	6.25	5.25	6.25	7.50	7.80	3.95	4.80
June	5.25	6.50	5.50	6.25	7.50	7.75	4.10	4.95
July	5.90	7.00	5.90	6.65	7.50	7.75	4.25	5.00
August	5.90	7.00	5.90	6.75	7.50	7.75	4.60	5.55
September	5.90	7.55	5.90	6.75	7.50	8.70	4.95	6.15
October	6.05	7.75	5.90	6.75	7.50	9.00	4.35	5.95
November	7.25	8.50	5.90	6.75	8.50	10.55	5.75	6.90
December	7.60	8.80	7.50	7.65	8.50	9.00	6.20	7.15

in addition hundreds of cars were thrown back upon the hands of the oven operators. Getting the production adjusted to the new scale of the demand was a fresh problem for the producers, while in the disposal of the rejected tonnages, they made sales as low as $3.50, a drop of more than $1 a ton from the price which prevailed just before the strike occurred. This, however, was more than compensated for later not only with the appreciation in the prices on contract shipments due to the advance in iron, but also from the fact that the spot market gained hourly in strength on account of the demands from steel companies unable to secure sufficient coal to operate their own ovens, as a result of the restoration of the fuel administration regulations incident to the strike of the coal miners.

More than $10, ovens, was paid on spot tonnages of both furnace and foundry beehive coke in December. On contracts, for first half of 1920, producers have been able to close what appear to be very advantageous arrangements. While some of the business in beehive furnace coke was negotiated at a flat price of $5.50, ovens, $5.75 and $6, later was done and contained a provision that the buyer was to share equally with the producer any increase in producing costs that might result from the strike of the union coal miners. Contracts calling for a fixed price, but without the wage increase proviso, were reported as high as $7.50, ovens, on furnace coke, while sliding scale agreements based on the price of basic valley iron, were concluded on ratios of 5½ and 5 to 1, as compared with 6¼ to 6 to 1 during the last half of last year. Connellsville foundry coke contracts were closed at $6.50 to $7.

The labor situation is the factor that most bothers coal and coke interests at the beginning of the new year. Common labor has not been plentiful for some time and since the strikes in the steel and iron plants and in the coal mines, foreign laborers who comprised the bulk of those employed in and about the mines and ovens, have left the country in large numbers and the exodus of more is expected. Only at a few brief periods in 1919 were the coke producers hard put for want of cars.

Cast Iron Pipe Declines Then Advances

CAST iron pipe went a considerable distance down the price hill during 1919. It declined practically 25 per cent during the first half, regained a large part of the decline during the last half, and closed the year a few dollars under the level prevailing at the beginning. Usually the price of pig iron is the ruling factor in the cost of cast pipe, though labor and freight also enter to a proportionate degree. It was natural, therefore, that pipe should follow downward as pig iron declined and that it rebound as pig iron stiffened and became dearer.

When the armistice changed the flow of business near the end of 1918, cast pipe was quoted at $60, base Birmingham, on sizes 6 inches and over. On Jan. 16, March 24 and May 14 reductions of $5 each were made, bringing the base price to $45, Birmingham, or a cut of 25 per cent. This was the low mark and it remained in effect until July 17, when an increase of $2 was made, followed by another of the same size Aug. 7. An increase of $4 was posted Sept. 18 and another of $3, Nov. 30, bringing the base price to $56, Birmingham. This was $4 less than the figure ruling at the beginning of the year.

Differential Change Raises Price

Another factor tending to increase the price was a change in the differential asked for class A pipe over class B from $1 per ton to $2. This caused the latter grade to range relatively $1 higher than before.

Most of the changes in price were put into effect first in western territory, the East following shortly in each such instance. At the beginning of the year indications were that prices would not change materially. Light demand at the prevailing level, however, caused the first decline and a slight increase in buying resulted. Jobbers, however, failed to respond and in the face of depleted stocks remained out of the market. The attempt at price regulation by the so-called Peek committee was a deterring influence until after a second reduction in pipe was made, following the reduction of pig iron as the outcome of the industrial committee experiment. This stimulated demand to some extent. Buying did not hold up steadily, however, though in May it was satisfactory and after the third cut in price cities bought more freely. In June some shading of about $1 to $1.50 was noted here and there, but that condition was temporary and the regular prices soon prevailed generally.

The increases of July and August gave the signal that the market was directed upward and buying then became heavier. Most of the demand was for small sizes, which overloaded the shops with that class of work, while larger pipe was neglected. As a result, some makers were inclined to shade on the larger sizes to obtain better balanced order books.

Late buying was good and several cities which had been taking large tonnages came into the market for still more pipe. At the same time, export demand from Cuba and South America became a factor and tended to balance the lack of domestic buying.

Throughout the year contractors bought freely and industrial needs for pipe and special castings were strong. This gave the shops excellent operations for the most part. In some instances cities planning large extensions and long supply lines found the cost of cast iron pipe too high. They bought wood pipe or steel pipe instead, confining their purchases of iron pipe to their distributing systems.

With the comparatively small tonnages taken by most cities, many much-needed improvements were allowed to lapse and the prospects for good business for the foundries in 1920 have been enhanced greatly by this unsatisfied demand.

Price Record of the Year

The average monthly prices of 6-inch class B cast iron pipe at the three principal market centers of New York, Chicago and Birmingham in 1919 are given below. Usually the fluctuations in these several districts were closely timed but at some intervals of the year, price advances in one territory preceded those in another by several weeks, so dissimilar were the trade conditions in these respective centers. The average monthly price record of the year is as follows:

	New York	Chicago	Birmingham
January	$66.50	$64.09	$59.00
February	62.70	61.80	55.00
March	61.65	60.55	54.50
April	57.70	56.80	53.00
May	56.75	54.80	52.00
June	52.70	51.80	48.00
July	52.70	52.60	48.00
August	52.95	54.80	49.00
September	53.20	55.80	50.00
October	56.70	59.80	50.00
November	58.30	59.80	53.50
December	61.30	62.80	55.75

Bar Mills Hopelessly Swamped

Steel Strike Followed by Coal Crisis Puts Makers Far in Arrears on Obligations—Carry Over Great Tonnage—Demand With Railroads Laggard, Exceeds Expectations—Prices Adhere to Orderly Course

PRODUCING steel bars in 1919 has been more like a hurdle race than an orderly progress of manufacture and trade. Expressed more exactly, it has been a race between production along a course strewn with obstacles, and heavy demand with a clear road ahead. Under these circumstances production has lost the race and lags far behind when the flag is dipped at the end of the year. Demand simply has been greater than the mills could meet, considering the great handicaps that developed one after another.

The surprising feature of the year has been that in spite of almost utter lack of railroad buying, usually estimated at an important fraction of the total output, and with greatly enlarged production facilities, demand from other sources has been too great to be filled. It had been feared that after the war demand was removed, some additions to capacity made during the struggle would be left idle because the business would not be available. The reverse has been true. With its most important outlet closed, the steel industry has not been able to produce within thousands of tons as much steel as has been needed.

The price situation through the year on steel bars has been simple. Following the armistice prices had been reduced $4 per ton from 2.90c to 2.70c base, on new business effective Jan. 1. In order to play fair with their patrons makers decided in January to revise contracts that bore higher prices, to the same market level. This gave consumers who had bought earlier the same price as those who bought late. On bars bought for definite projects, on which the selling price had been fixed, this reduction did not apply. It was spread over bars for manufacturing purposes however where this material would compete with later purchases. This was a virtual gift of $4 per ton to all contract holders.

Under an agreement made during the Peek conference, a further cut was made March 21 to 2.35c, base Pittsburgh representing a reduction of $7 per ton. This price remained in force steadily throughout the remainder of the year, with the largest producers though in the last quarter heavy premiums could have been obtained for prompt bars. Some independent makers in the East made an advance of $3 per ton, to 2.50c, Pittsburgh, in September, but this was not general. The 2.35c, Pittsburgh, figure was applied by various mills to bookings made during the last half for delivery during the first half of 1920, the effort to hold prices level being carried over into the following year.

Under the uncertainty of the situation little demand for steel bars developed in January, as consumers had not been able to readjust themselves after the close of the war. Much confusion then resulted from the abrupt change from war to peace production. The improvement came first in the West and Chicago mills felt it early in February. In a short time consumers began to need tonnage and pressed the mills for immediate delivery. In the East the rebound came a little later but was equal in intensity.

Before the end of first quarter the idea had gained currency that railroad buying would be started soon and there was a rush to get on mill books ahead of that business. Insistence on prompt delivery continued strong as manufacturers found a ready sale for their products. Mills were soon booked full and the expected railroad buying still hung over the situation as a threat to laggard buyers.

About this time the Redfield-Peek plan to stabilize prices came forward as a disturbing factor and demand was weakened for a time, though the experience of earlier months when contracts were reduced served to limit this somewhat. Buyers believed they would be protected in the event of lower prices being agreed on and the outcome proved their faith.

For a time in March, Chicago mills quoted 2.70c, Chicago, probably in anticipation of the reduction made by the industrial conference. Announcement in March of 2.35c, Pittsburgh, as the new price stimulated buying as everyone expected business to go ahead on that basis. The bulge was short-lived owing to the controversy over rail prices that developed between the industrial board and the railroad administration and deeper uncertainty than ever gripped the situation for a number of weeks. Consumers ceased seeking contracts and buying became hand-to-mouth.

In May the situation had cleared somewhat and the entrance shortly afterward of two large automobile and truck manufacturers, the Ford Motor Co. and the General Motors Corp., for their requirements to July, 1920, gave much strength. However, the absence of railroad and agricultural implement buying served as a drawback. Other automobile makers covered in midyear and agricultural implement manufacturers bought separately from time to time.

Some shading of the 2.35c, Pittsburgh, price had been done during second quarter, but by July this had ceased and the market was strong. Tractor builders took a heavy tonnage early in the third quarter, and large contracts with car builders for repairs which the railroads could not do for themselves gave considerable tonnage to offset the lack of buying by the roads. The market was in full swing by this time, with general buying proceeding apace among the special classes of consumers noted. Production was keeping up well with demand, the smaller obstacles of the earlier months having been surmounted without loss.

Then came the first setback of moment. Employes of railroad car shops went on a strike, and the supply of cars became so short it was neces-

Bar Iron Prices

BI-MONTHLY WAGE SETTLEMENTS SHOWING AVERAGE PRICES

	1915	1916	1917	1918	1919
Jan.-Feb.	1.024c	1.40c	2.35c	3.10c	3.10c
Mch.-Apr.	1.05c	1.60c	2.45c	3.30c	2.75c
May-June	1.10c	1.85c	2.65c	3.35c	2.50c
July-Aug.	1.15c	1.95c	2.75c	3.40c	2.50c
Sep.-Oct.	1.20c	2.00c	2.85c	3.45c	2.50c
Nov.-Dec.	1.30c	2.15c	2.95c	3.45c	.....

ANNUAL AVERAGE OF SETTLEMENT

1919 (10 months)	2.47c
1918	3.32c
1917	2.67c
1916	1.825c
1915	1.137c
1914	1.1843c
1913	1.4421c
1912	1.2645c
1911	1.2598c
1910	1.4423c
1909	1.360c
1908	1.386c
1907	1.627c

sary for the mills to curtail production for several weeks, especially in the West, while buying continued unabated. Orders began to back up and deliveries to be deferred. Production then fell behind and not again during the year was it in the running in the race with demand. By September most mills were sold up for the remainder of the year. Some makers advanced $3 per ton, though most of them adhered to the fixed price. In the ninth month booking for 1920 delivery was started at the same price as for 1919.

Strike Cuts Off Output

Just before the third quarter closed, Sept. 22, the strike of steel workers came to cut production again. Though operations were continued full in some mills and in part by others, some were forced into idleness for several weeks. The loss of production was heavy before it was possible to resume with anything approaching full forces of men. Consumers supported the mills in their struggle and were not insistent in their demand for material, but after production was resumed much pressure was brought to bear to obtain steel.

Booking of orders from that time on was done carefully, only regular customers being allowed to place their tonnages and then only in quantities based on previous purchases. Some mills stopped selling entirely while others continued to accept orders, subject to indefinite delays. Production then fell hopelessly behind the demand. During October the mills picked up in operations until November found things fairly normal and deliveries were going forward in volume sufficient to keep most users satisfied.

Then came what was the biggest setback of all in the case of western mills, from which eastern producers escaped in part, the strike of bituminous coal miners in November. Though the large mills had sufficient coal to carry them through, these supplies were commandeered and only part operation was allowed, the remainder of the fuel being used for purposes deemed more essential by the government.

With their books overflowing bar mills were forced to curtail to 50 per cent operation and even less, while smaller companies which did not carry a reserve of coal were shut down completely Dec. 1, and saw little hope of resuming until 1920. At this last obstacle, production fell back hopelessly while demand kept on and new tonnages were sought for 1920 delivery.

Fortunately, in a comparative sense, users of bars also were forced to curtail operations and inability to produce was matched in some degree by inability to use the steel. This afforded slight comfort to the mills however with the congested condition of their order books. The mills ended the year with millions of tons on order, big business in prospect for 1920 and facing great obstacles toward the filling of this business. Deliveries then were a matter of three months or more.

Bar Iron Also Affected

Bar iron had a hard time, no whit less discouraging then soft steel bars. No reduction was made at the beginning of the year in this product by eastern mills, which sought to maintain 3.50c, Pittsburgh. Chicago producers reduced to 2.90c, Pittsburgh, but buyers hesitated at that price and sought to force a quotation of 2.70c, Pittsburgh, the same that was quoted on soft steel bars. Buying was slow and by the end of January western mills yielded to meet steel bars. Eastern mills still maintained 3.50c, Pittsburgh. The difference in the product of the two sections accounts for part of this difference.

Shortly after this Chicago mills yielded another dollar and quoted under soft steel as business was light and some plants were closed. Eastern mills reduced $8 per ton, to 3.10c, Pittsburgh. These concessions did not stimulate demand. Railroad buying, usually depended on for much of the bar iron tonnage, was absent.

In April the western quotation fell to 2.50c, Pittsburgh, and then to 2.50c, Chicago. Some railroad and wagon tire business appearing at this level, prices firmed up somewhat. Summer business was fair but in early fall mills began losing time again, going into the steel strike period with little business. As the bar iron mills were not affected by the strike, business picked up as steel bar users turned to iron. The iron mills soon were filled. Orders continued in sufficient volume to give a backlog and by the beginning of December, makers were sold for the remainder of the year and were running full for the first time during 1919.

Coal Strike Closes Plants

The coal strike then hit a number of the iron mills hard and in the second week of the strike every western plant was closed for lack of fuel with no hope of resuming until 1920. Eastern mills were less affected and continued to turn out some material. Western quotations were 2.65c, mill, in October, firming up until 2.77c to 3.00c, mill, represented the market when the shutdown came.

The course of hard steel bars rerolled from rails was much the same as steel and iron bars. This material started the year at 2.80c, mill, with demand so light that many mills were idle from time to time, running only when sufficient orders had been accumulated to make operations possible. In April agricultural implement buying started sufficiently to allow better rolling schedules. The quotation then was 2.45c, mill. In July buying equaled production and because of scarcity and high market for rerolling rails, the price advanced $2 in August, to 2.55c, mill.

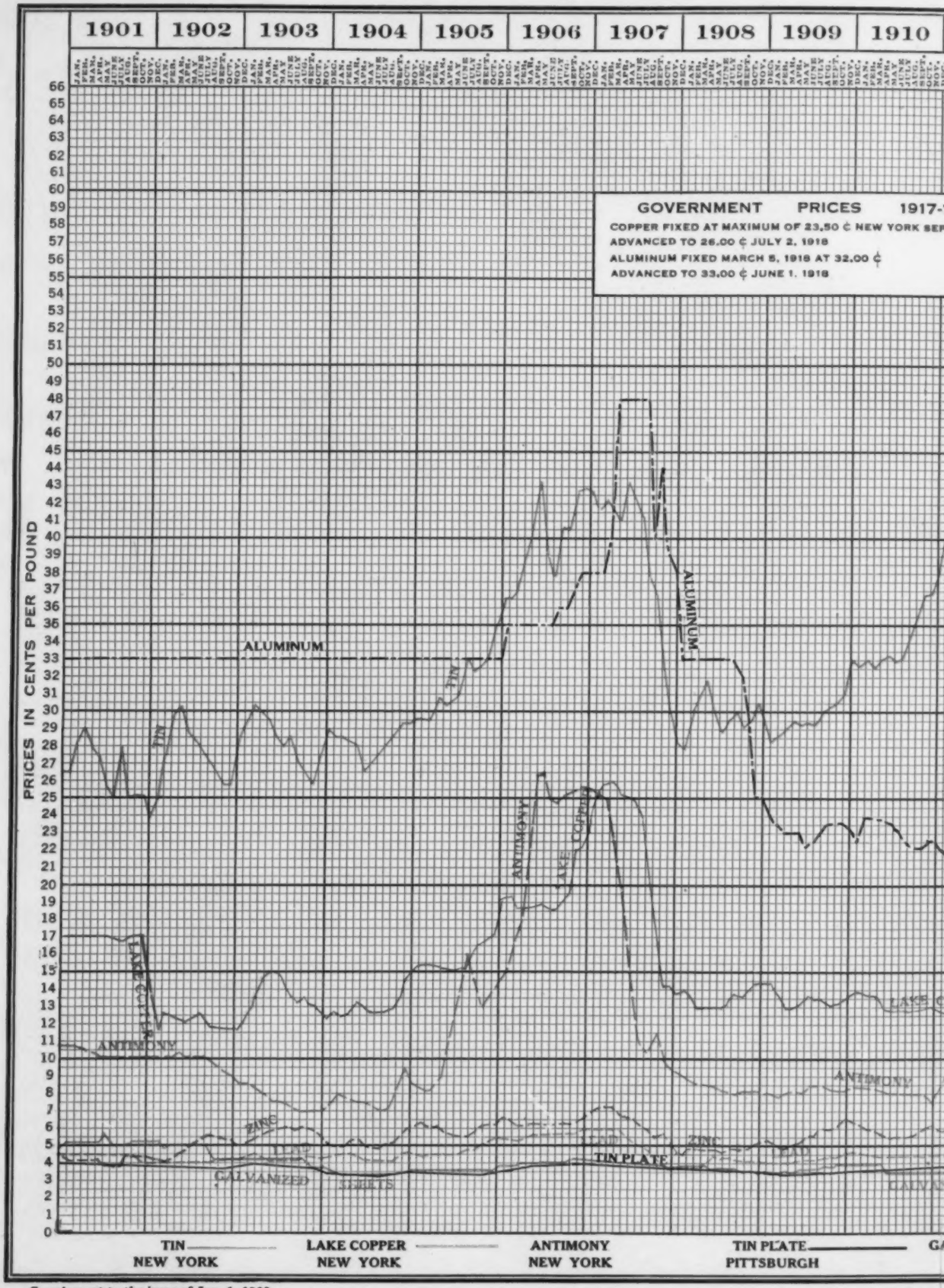
From this point hard steel bars were in much demand. The strike of steel workers did not affect the rerolling mills, while users turned to high-carbon bars in the absence of soft steel. Prices rose steadily and reached 3.00c, mill, in October. At that time the mills were turning down orders and were booked for the remainder of the year. The intervention of the coal strike forced these mills in the west to close without hope of resuming until 1920 and prevented activity at the only time the opportunity was offered them to go ahead at full speed.

Wire Market One of Opposite Extremes

EXTREMES of demand characterized the year of 1919 in wire products. The first half of the year offered comparatively little business, while it was impossible to meet demands during the latter half. A virtual famine was caused in the final months, especially in nails. This condition resulted from conditions common to all branches of the iron and steel industry, namely hesitation of buyers during the early period in the expectation of lower prices and interference with production by strikes in the second half, when orders were

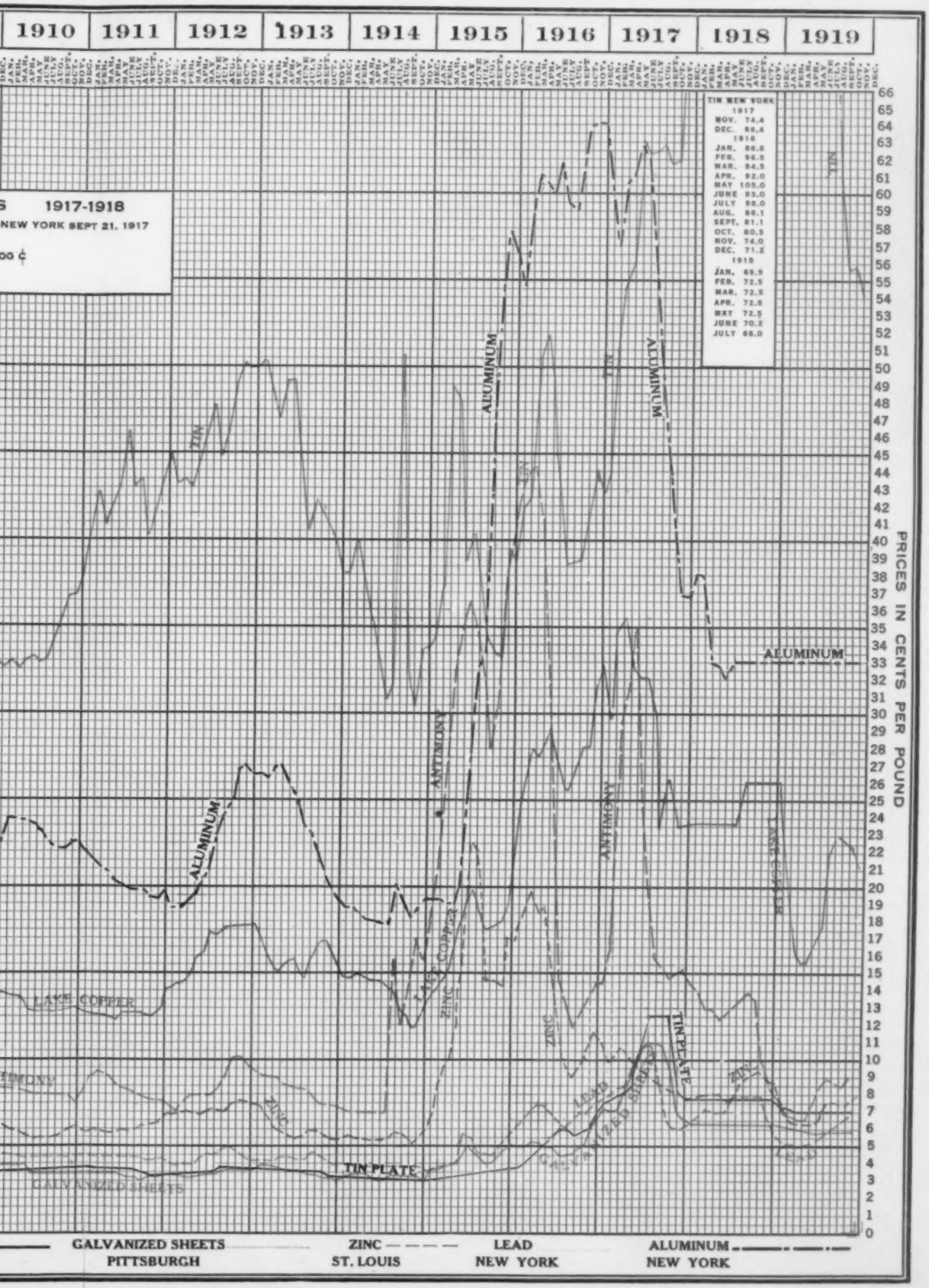
THE IRON TRA

Fluctuations in prices of pig tin, aluminum, antimony, lake coppe



RADE REVIEW

e copper, zinc, lead, tin plate and galvanized sheets, 1901-1919



crowding mill books of all companies.

The year of 1919 opened with slow demand and observors expected this condition to continue for some time. Export inquiry was excellent but on account of lack of ship space it was difficult to realize on the offered tonnage. Mills were able to operate at 60 to 80 per cent on the business booked. In spite of this condition January sales were about 10 per cent over those of the preceding December.

Inasmuch as postwar conditions were uncertain and the future was clouded, buyers sought guarantees against declines. Jobbers particularly were averse to stocking nails in the face of a possible decline. The mills, however, did not see their way clear to make such guarantees. This caused buying to be done on a spot basis almost entirely and stocks were worn down gradually as the middleman hesitated.

When the price conference sought in March to regulate prices by agreement buyers stopped their orders and a further period of uncertainty ensued. Even after the schedule was reduced in conformity with the general cut under the Peek plan buying was slack and demand was only 60 to 65 per cent of normal for the season. But jobbers found themselves short of supplies and began asking better delivery. By the end of May demand had grown to 85 per cent of normal, the best figure reached since the armistice, and inquiry was increasing steadily.

June saw the real turn of affairs and from slackness the market turned at once to a condition of heavy buying. Jobbers began to contract for 60 days ahead which was as far as the mills would sell, and specifications were received to the limit of productive capacity. Operation then was 80 to 85 per cent and jobbers' stocks were drawn on heavily. Deliveries on manufacturing wire were extended to four weeks and in a short time makers refused further nail contracts, so full were their books. An advance expected in July failed to materialize as the leading interest refused to increase its quotations. Jobbers continued to buy for stock as heavily as the mills would accept orders. Prices firmed up as all mills accumulated backlogs and some refused to accept further orders.

Independents Advance Prices

This condition continued to the point where several independent makers advanced quotations on various products $2 to $5 per ton. The leading interest did not follow this increase and as a result was flooded with inquiries from buyers anxious to get under cover. No contract was allowed to lapse and full specifications were filled. It became necessary at once to use great care in accepting orders and all mills soon began weeding out buyers who were not regular customers. Even this did not suffice and in August it was necessary to announce that buyers could contract only to the extent of their average tonnages in 1917 and 1918. Export business in wire and nails grew steadily and reached an average of 10,000 tons per month in August.

Famine conditions began to show before the end of third quarter and in spite of the insistence of buyers it was almost impossible to place orders as most mills were full to the end of the year. The strike by railway shopmen interfered with shipments as a result of the artificial car shortage and reduced production to some extent, also.

Though independent makers continued the higher quotations through the last half, the leading maker held to the March 21 schedule, following the policy of the Steel corporation to keep prices down, and by its influence prevent a runaway market, deemed disastrous under conditions prevailing in labor, general merchandise and finance. In spite of the higher level of prices quoted by the independents, they suffered no lack of business and many buyers offered premiums in an effort to obtain material.

The strike of the steel workers in September put the finishing touch on the troubles of makers and buyers, by interrupting production seriously over several weeks and forcing it much below normal for a considerably longer period.

Jobbers were relied on to fill the gap, which they did to a large degree, but, in turn, they besieged mills to make large shipments after the strike was over, to replace what they had sold. This was wellnigh impossible under the conditions. Renewed building operations over the entire country in the endeavor to meet housing needs had caused unusual demand for nails, and it was impossible to meet this need adequately. Nails simply could not be produced fast enough to keep a supply in the hands of jobbers and a famine resulted during the last quarter.

After September mills were able to accept comparatively little new business and most of them had sufficient orders on their books to engage full normal operations to the end of the year. But normal operation was not possible because of disorganization arriving as an after-effect of the steel strike. Troubles were not over even then and the coal strike in November caused curtailed operation and shutdowns to the point where production was brought to a low ebb and the supply was further reduced.

As usually is the case when a scarcity exists, demand at the end of the year assumed gigantic proportions, the cumulative result of half a year of repression and lowered production. With this heavy demand unfilled the prospects for active trade in 1920 are bright and the mills seem likely to have full order books for many months, unless some unforeseen condition intervenes to cut off demand. Late in the year the probable nail demands for 1920 were placed at 20,000,000 kegs and in view of the heavy orders for 1919 delivery carried over, some doubt was expressed as to how these wants would be supplied.

A change in policy at the beginning of the year caused the issuing of a new price list on fencing, increasing the spread over fencing wire and eliminating many styles of fence. The previous concession to manufacturers also was cut out, as its necessity passed with the end of the war.

Oil Boom is Big Stimulus to Mill Pipe

OIL and gas well development, held up or prosecuted on an extremely limited scale in 1918, due to the war, went forward in 1919 with redoubled energy and provided the foundation for one of the busiest years the wrought pipe industry ever has known. The first month of the year was hardly under way before demands began to appear for drive pipe, drill pipe, casings and line pipe. While uncertainty over prices held up actual orders for a time, business began to flow in along in March, while by June makers were sold months ahead. The last half of the year began with capacity in this class of tubular goods booked to the end of the year. This excessive demand in oil and gas pipe continued right up to the beginning

Changes in Discounts of Standard Steel Pipe

Date	Sizes in Inches	Butt Weld Basing Black	Butt Weld Discount Galv.
Jan. 1, 1910 to Oct. 1, 1910	¼ to 6	78	68
Oct. 1, 1910 to Oct. 2, 1911	2 to 3	80	70
Oct. 2, 1911 to Dec. 1, 1911	2 to 3	81	74
Dec. 1, 1911 to Dec. 15, 1911	2 to 3	83	76
Dec. 15, 1911 to Jan. 1, 1912	2 to 3	83	76
Jan. 1, 1912 to July 1, 1912	2 to 3	82	75
July 1, 1912 to July 24, 1912	2 to 3	82	75
July 24, 1912 to Sep. 10, 1912	2 to 3	81	74
Sep. 10, 1912 to Jan. 1, 1913	2 to 3	80	72
Jan. 1, 1913 to Apr. 12, 1913	¾ to 3	80	71½
Apr. 12, 1913 to May 27, 1913	¾ to 3	79½	71
May 27, 1913 to Aug. 8, 1913	¼ to 3	79	70½
Aug. 8, 1913 to Oct. 27, 1913	¼ to 3	80	71½
Oct. 27, 1913 to Feb. 2, 1914	¼ to 3	80	71½
Feb. 2, 1914 to Apr. 20, 1914	¼ to 3	79½	71
Apr. 20, 1914 to Nov. 2, 1914	¼ to 3	80	71½
Nov. 2, 1914 to Feb. 11, 1915	¼ to 3	82	73½
Feb. 11, 1915 to May 1, 1915	¾ to 3	80	69½
May 1, 1915 to June 1, 1915	¾ to 3	79	68½
June 1, 1915 to June 17, 1915	¼ to 3	79	63½
June 17, 1915 to Aug. 15, 1915	¼ to 3	79	57½
Aug. 15, 1915 to Nov. 1, 1915	¼ to 3	79	63½
Nov. 1, 1915 to Jan. 4, 1916	¼ to 3	78	63½
Jan. 4, 1916 to Jan. 20, 1916	¼ to 3	77	62½
Jan. 20, 1916 to Feb. 15, 1916	¼ to 3	76	60½
Feb. 15, 1916 to Feb. 29, 1916	¾ to 3	75	59½
Feb. 29, 1916 to Mar. 15, 1916	¾ to 3	74	57½
Mar. 15, 1916 to Mar. 29, 1916	¼ to 3	73	55½
Mar. 29, 1916 to Apr. 21, 1916	¼ to 3	72	53½
Apr. 21, 1916 to July 24, 1916	¼ to 3	70	50½
July 24, 1916 to Sept. 7, 1916	¼ to 3	70	55½
Sept. 7, 1916 to Nov. 1, 1916	¾ to 3	69	55½
Nov. 1, 1916 to Nov. 15, 1916	¾ to 3	69	55½
Nov. 15, 1916 to Dec. 4, 1916	¼ to 3	68	54½
Dec. 4, 1916 to Dec. 30, 1916	¼ to 3	66	52½
Dec. 30, 1916 to Feb. 14, 1917	¼ to 3	64	56½
Feb. 14, 1917 to Mar. 5, 1917	¼ to 3	62	48½
Mar. 5, 1917 to Apr. 2, 1917	¼ to 3	60	46½
Apr. 2, 1917 to Nov. 6, 1917	¼ to 3	55	41½
Nov. 6, 1917 to Jan. 1, 1919	¾ to 3	51	37½
Jan. 1, 1919 to Mar. 21, 1919	¾ to 3	54	40½
Mar. 21, 1919 to	¼ to 3	57½	44

of 1920, and makers enter the new year with heavy obligations on their books which will take up capacities for several months.

So unlimited do the future possibilities of the oil industry appear that it is not surprising makers of oil country goods look as they do merely upon 1920 simply as the first of many years of huge demands for pipe for this purpose. While some concern is felt in the steel trade that there may not be enough steel to meet both the present obligations of the manufacturers and the large requirements likely to come out this year from the railroads, this is a matter that is giving the pipe manufacturers little or no anxiety. This is because tubular products largely are made of bessemer steel or wrought iron. Moreover none of the latter is going into line pipe because of its cost. Not alone in oil country pipe, however, does the year of 1920 promise to be an exceedingly busy one. The prospect for a countrywide building campaign which would involve huge demands for merchant or standard pipe, is considered as extremely good. While new construction in the way of house, hotel and office buildings was on a fairly extensive scale in 1919, there was not a city in the country where sufficient housing, rooming or office space existed at the end of the year.

The opening of the new year finds all of the manufacturers of pipe with a heavy accumulation of business in both oil country and merchant pipe, the result largely of the unsettled labor conditions of the last quarter of 1919. Curtailment in the output of the mills has created demands upon the jobbers that has left them bare of supplies. The strike of the iron and steel workmen, though directed primarily at the Steel corporation did not much affect its pipe-making subsidiary, the National Tube Co. The Riverside plant of this company at Benwood, W. Va., went down on the first day of the strike, but outside this and a temporary suspension at one of its Pittsburgh plants, it was able to keep all works going and most of the time practically full. The Jones & Laughlin Steel Co., also escaped serious results from the walkout of Sept. 22, but the other large makers of tubular goods were less fortunate. The Youngstown Sheet & Tube Co. and the Republic Iron & Steel Co., the Wheeling Steel & Iron Co., and LaBelle Iron Works, were forced to suspend and were a long time in getting back to production. The A. M. Byers Co. and Spang, Chalfant & Co., also were forced to close for a time. All companies were obliged to reduce production again in December as the resut of the coal strike.

In common with all iron and steel products, the outset of 1918 was marked by a period of light demands for wrought pipe. The reduction in prices of both steel and wrought iron pipe of $6 per ton, putting the base discounts on standard steel pipe to 54 per cent on black and 40½ per cent on galvanized, recommended at the last meeting of the general committee of the American Iron and Steel institute and the war industries board in December, 1918, failed to give buyers confidence. The latter were incined to a hand-to-mouth buying poicy during the first few months of the year. General business was not greatly stimulated by a second cut on March 21, adopted by the Manufacturers as the result of the efforts of the industrial board. This reduction which was 3½ points, or $7 per ton, brought the discount on the base sizes of standard steel pipe to 57½ per cent, and 44 per cent, respectively, on black and galvanized. Although there were reports that some makers were shading prices during the early part of the summer, these discounts held throughout the year as the more general basis of business by most makers. The only deviation came on July 16, when the Wheeling Steel & Iron Co. announced an increase of 2½ points on buttweld and of 5 ponts on lapweld pipe.

Seamless Tubes in Demand

Makers of wrought iron pipe quoted the base sizes of buttweld pipe, ¾ to 1½ inches, at 36 per cent discount on black and 20 per cent discount on galvanized at the outset of the year. They held to these discounts until March 21, when a cut of 3½ points, or $7 per otn was made. Effective Oct. 28, the price was advanced $8 per ton on lapweld and $10 on buttweld. The new discounts were 34½ per cent and 18½ per cent, respectively on the base sizes of buttweld and 30½ per cent on black and 17 on galvanized in the base sizes, 2½ to 6 inches, of lapweld pipe.

Activity in boiler and mechanical tubes was not particularly brisk until late in the year, though seamless tubes were in good demand from the automobile builders. Lack of much locomotive building during the year kept boiler tubes in check and the large tonnages left over as a result of the ending of the war, was a restrictive influence upon business while they were available.

Ferroalloy Year in Three Phases

Period of Liquidation Followed by One of Competition, Brings Stage Where Demand Exceeds Supply—British Ferromanganese Returns as Factor —Conditions Incident to War End Are Chief Influence

THREE well defined phases characterized ferromanganese trade during 1919. First of these was the period of liquidation that occupied almost all the first half and which, in fact, did not culminate until the beginning of the last quarter. Second was the competition which developed in midsummer between English and domestic makers. In the third phase, during the last quarter, the process of liquidation had come to an end and the supply of the metal was scarce, so that the market turned steadily stronger.

During the period of liquidation, the producers of ferromanganese, both domestic and foreign, were interested mainly in delivering tonnage due on old contracts. The amount of new business offering was of small proportions and there was no incentive to attempt to stimulate buying by reducing prices. During this period the market was determined by the prices done on resale lots, and it was usual for resale prices to range $25 to $75 a ton below the quotations which producers were asking. There were some exceptions to this rule In the latter part of February, 80 per cent ferromanganese was offered at first hand at $150, delivered, which about represented the resale market at that time. Early in March, however, this figure was withdrawn by the single producer who had offered it. Makers then again quoted the $225, delivered, figure which they were asking and in some cases, obtaining, when the year opened. Toward the end of March, when resellers were offering at $110 to $120, delivered, and after one maker had sold considerable metal at $130, the producers' price was lowered to $150, delivered, on 80 per cent. In May the furnaces continued to ask $150, although one maker sold some 80 per cent at $110, which then represented the resale market. At the opening of June, the first hands reduced their price to $125, delivered, and before the month was half over, reduced further, taking several thousand tons of 78 to 82 per cent metal at prices ranging from $110 to $120, delivered. Before the end of June, the price had gone to $110, flat. This was the first real business of the year and altogether during June at least 10,000 to 15,000 tons were placed on order books. A feature of the resale business that dominated the market during the first half was that in many cases the metal was offered by interests which were less anxious to sell than to establish a price on which to base claims against the government.

The second period, that of sharp competition between the makers developed early in July. This period was characterized by a trade contest both between English producers and between English and domestic producers. Early in July American producers put up their asking price to $125, delivered, feeling that this move was justified by the volume of business which had been placed on their books. This figure proved of no significance with respect to new business, however, and by the middle of the month a fair amount of new tonnage was booked at $115. Importers as early as March had been authorized to offer English ferromanganese, guaranteed to contain 76 per cent, at $150, c.i.f. tidewater, and in May this figure was reduced to $145. It was not until the latter part of July that English metal really became a factor. At that time, English ferromanganese was offered at $105, tidewater, equivalent to around $110, delivered at consuming plants. This figure, therefore, was, in effect. a price competitive with the $110 quotation at which the domestic makers sold heavily in June. During August the competition by English metal became stronger and sales of several thousand tons were made at $100, tidewater, with the result that domestic makers in some cases quoted $105, delivered, in order to obtain some of the business offered, which then aggregated several thousand tons. Toward the end of August the importers closed orders at least 3000 to 4000 tons at $95, tidewater.

There then developed an unusual action whose effect was to discourage competition from England. At the end of August, domestic producers laid a formal charge before the federal trade commission that the importers and British producers were violating the so-called anti-dumping law by selling ferromanganese here at prices lower than their domestic market, and with the intention of driving the American makers out of business. Although the American makers appeared in Washington and were granted a hearing by the federal trade commission, the disposition of the charge, because of prior matters engaging the attention of the trade commission, was postponed indefinitely. But the effect of the action was immediate. It resulted, practically in the withdrawal of the English producers as active competitors for American business. Around the middle of September and October English ferromanganese was to be had at $105, tidewater, and early in October, one importer was authorized by his principal to offer at $100, tidewater, which, in view of a reduction in the market in England, and of the unfavorable exchange rate, was said to be the equivalent of the English domestic price. Still another importer made offers at $110, delivered. There also was a quotation of $103, tidewater. Some sales were made at these figures but they did not involve any important tonnages as far as known. During November, English ferromanganese virtually was not a factor. About the middle of November one importer was authorized to quote $125, tidewater. Inasmuch as this figure was $15 higher than the domestic market, it signified, in effect, that this English interest was willing to take 1920 business when the market reached that level. As a matter of fact, the English producers at that time were not anxious to sell, largely because of the good sized volume of business they had on their books from consumers at home.

The last half of November was marked by active buying from domestic makers for delivery over the first half of 1920. In view of the liquidation of stocks during the earlier portion of the year, and the curtailment of production to meet actual demand, combined with the practical withdrawal of the English makers, the inception of this buying movement found the market in a very satisfactory statistical position. All surplus stocks had been absorbed by consumers and there was a total lack of pressure to sell. This business, amounting to a good many thousands of tons, was taken at $110, delivered, but it led to an advance, in the last week of the month to $120. Toward the last of the month sales of size were made at the new figure, following which importers began to offer English metal for first quarter at $110, c.i.f. tidewater.

With 70 per cent ferromanganese the standard during the war, in order to permit the use of the domestic ores, and thus cut down the amount of shipping required in bringing in high grade foreign manganese ore, metal of this grade was a market factor early in the

year. But the production of 80 per cent was resumed as soon as practicable after the armistice was signed, and by February such sales again featured the market. Inasmuch as the early part of the year was a period of liquidation and of steadily declining prices, and the demand was so slight that there was no firm price level, resales comprised most of the business. One feature of this situation was the lack of a recognized differential between the prices on 70 per cent and 80 per cent. As the year progressed and the stocks of 70 per cent were absorbed, the latter grade took rank as off-quality metal and brought a lower price on a unitage basis, as a rule, than 80 per cent. Roughly speaking there was practically no distinction as to prices on 70 and 80 per cent during January, February, March and April, with respect to the figures that obtained on resale. In May, 70 per cent was quoted at around $100, as compared with $110 for 80 per cent. In June, July, August, September and October, the 70 per cent market averaged around $90. Toward the latter part of November there was a slightly stronger market for off-ferromanganese due to the scarcity of 80 per cent for spot and nearby shipment.

It was estimated that when the year began, about 20,000 tons of English ferromanganese were due on old contracts. On Jan. 13 importers received telegrams from the war trade board that they might have licenses for importing tonnages contracted for prior to April 6, 1917. The larger part of this metal had been sold during 1916, at prices generally ranging from $174 to $175, tidewater, but some had been placed at $38. Although it was not until April that the war trade board announced ferromanganese and spiegeleisen might be imported freely thereafter, the effect with reference to tonnages booked after April 6, 1917, was not pronounced, since during February and March importers had obtained licenses for the metal previously disposed of. In a number of cases English producers married these old unfilled tonnages to new contracts, with resulting prices about equal to the resale market at the time.

Spiegel Has Backward Year

Spiegeleisen, excepting for the fact that domestic producers did not meet with any foreign competition for home business, underwent the same conditions as ferromanganese. Liquidation proceeded without interruption during the first half, and during the second half it was not until December that prices showed an upward tendency. In November was witnessed the singular spectacle of an active business in spiegeleisen at prices lower than those on foundry pig iron.

At the beginning of the year 16 per cent spiegeleisen was quoted nominally at $67.50, furnace, and before the end of the month had dropped to $60, while 20 per cent was at $67. The latter grade again was coming into the market because the war ban on metal higher than 16 per cent had been lifted. By the end of February 16 per cent was to be had at $45, furnace, and 20 per cent at $50. By the end of April there were resales at $33 to $35, furnace, for metal ranging from 16 to 20 per cent and in May there was further business at this level. In April an Italian buyer placed an order for several hundred tons but the sale was not consummated because of the inability of the buyer to get permission of his government to establish the necessary credit here. Resales in May carried the market to lower than $30. In the latter part of May there developed the first important sale since the armistice; this involved 2000 tons sold at first hand at $27.50, furnace, for month sales of several thousand tons of 16 per cent. There followed in the same similar grade at $25 to $27.50, furnace, plus a differential of 62½ cents for each additional unit. This business had the effect of putting the market upon an even keel, and there followed, in June, sales of round tonnages at $30 to $32.50, furnace, for 16 to 20 per cent. In July, several thousand tons of 18 to 22 per cent were sold at $30, furnace. The market continued to reflect a consistently upward tendency, prices on round tonnages ranging up to $33 and $34, furnace, for 18 to 22 per cent, while in numerous instances $35 was obtained. During the summer and fall there were sales of large tonnages for export, to Italy, Holland and Belgium particularly. In the latter part of November a domestic buying movement of large size developed, mostly for first half delivery, at $35, furnace, for 18 to 22 per cent metal. Following this, at the end of November, one maker advanced his price to $45, although metal still was obtainable from other producers at $35.

Average contract prices of ferromanganese at seaboard during 1916, and delivered at consumer's plants during 1917, 1918 and 1919, are as follows:

	1919	1918	1917	1916
January	$212.50*	$250.00	$175.00	$110.00
February	165.00	250.00	192.00	140.00
March	134.00	250.00	212.50	175.00
April	113.75	250.00	250.00	175.00
May	110.00	250.00*	375.00	175.00
June	111.75	250.00*	400.00	175.00
July	111.00	250.00*	400.00	175.00
August	110.00	250.00*	387.50	170.00
September	105.00	250.00*	380.00	164.00
October	110.00	250.00*	300.00	160.00
November	110.00	250.00*	247.50	155.00
December	.....	236.00*	247.50	162.50

*Prices from May, 1918, to January, 1919, inclusive, were based on 70 per cent ferromanganese. All other prices in above table were based on 80 per cent metal.

Average monthly prices for spiegeleisen follow:

	1919	1918	1917	1916	1915
January	$67.50*	$59.00	$57.50	$32.50	$25.00
February	52.50*	59.00	66.25	42.50	25.50
March	42.50*	65.50	77.50	55.00	26.00
April	34.50*	70.00*	76.75	60.00	26.00
May	31.35*	71.00*	78.00	60.00	26.00
June	27.50*	75.00*	83.00	55.00	26.00
July	34.00	75.00*	85.00	47.50	26.00
August	34.00	75.00*	81.25	47.50	26.00
September	34.00	75.00*	80.50	45.00	29.00
October	34.00	75.00*	73.50	40.00	30.00
November	34.00	75.00*	63.25	45.00	30.00
December	35.00	72.50*	60.00	50.00	30.00

*Prices from and including April, 1918, and to and including June, 1919, are for 16 per cent spiegeleisen. All other prices apply to 20 per cent metal.

Manganese Ore Stocks Large

Stocks of manganese ore at furnaces, or due on old contracts, were unusually large at the beginning of the year. This ore generally had been bought at high prices prevailing during 1918 so that the comparatively low market on ferromanganese during 1919 spelled actual loss to producers of the latter metal. All through the year buying of ore lagged. The first sale of any consequence occurred the latter part of January, 2500 tons of Brazilian mineral for nearby arrival bringing 85 cents a unit at tidewater. At that time the market on Brazilian ore for early shipment was about 75 to 80 cents although this level was a nominal one. In June a lot of 8000 tons of Brazilian ore was closed at 60 cents a unit, tidewater and a tonnage of Indian ore of about the same size also was sold at that time. During the third quarter there were scattered sales, both by first and second hands, at prices ranging from 45 to 55 cents. Toward the latter part of November more interest in manganese ore was shown and in some cases consumers expressed a willingness to pay close to 60 cents a unit.

Conclusion of war demand and liquidation of stocks dominated the markets for the specialties among the ferroalloys during 1919. Prices declined almost steadily from the time of the armistice, Nov. 11, 1918, to the autumn of 1919, when there was a tendency toward steadiness, indicating the cost levels had been about reached, if not pssed in some lines. Production was curtailed drastically, but the large stocks existing at the timme of the armistice assured a sufficient supply of several of the alloys during much of the year.

Ferrovanadium was an exception to this rule. Fire at the plant of the Primos Chemical Co. in Colorado kept this producer out of the market a large part of the year. Landslides and other difficulties at Peruvian properties of the Vanadium Corp. of America also were reported, which together with transportation difficulties curtailed the supply of the principal producer. The market for fer-

rovanadium opened the year at above $5 a pound and by May a shortage was feared and buying was heavy, putting prices of high grade ferrovanadium to around $7.50 a pound contained, for high grade material. Later the leading producer offered alloy at around $5.50 a pound contained for alloy running high in silicon, in wholesale quantities, while low silicon alloy settled to around $7 a pound contained, where it closed the year.

The ferrotungsten market experienced a prolonged period of liquidation, in which prices were marked down from $2.65 a pound contained at the time of the armistice to $1.10 by December, 1919. The decline in prices was accelerated by low priced offerings of foreign ferrotungsten, particularly from England. The decline was particularly abrupt in the early months of the year. Quotations on various dates follow: Nov. 11, 1918, $2.65 a pound contained; Jan. 1, 1919, $2.35; Feb. 1, $2.10 to $2.20; March 1, $2 to $2.15; April 1, $1.75; May, $1.40; June, $1.30 to $1.35; July, $1.25 to $1.30; Aug. 1, $1.20 to $1.25; Sept. 1, $1.20 to $1.25; Oct. 1, $1.15 to $1.20; Nov. 1, $1.15 to $1.20; Dec. 1, $1.10 to $1.20. Heavy supplies of tungsten in the form of ferrotungsten, tool steel and tungsten concentrates kept the market depressed during the year.

The ferrochrome market was slower in passing through the period of liquidation and readjustment, quotations holding fairly steady in the early months of the year, but later on, offerings of French and English alloy brought prices down. The quotation for ferrochrome containing 60 to 70 per cent chromium and 6 to 8 per cent carbon was 35 to 37 cents a pound contained at the time of the armistice. This price held almost to February, when it declined to 30 to 35 cents, then to 30 to 32 cents, where it remained until August. About this time some lots of foreign alloy were sold as low as 20 cents a pound, delivered, duty paid and the domestic market dipped temporarily to 22 to 24 cents, whence it rapidly recovered to 27 to 29 cents in November. There was some tendency toward cutting this price in November and December, on large contracts for 1920 delivery.

The 50 per cent ferrosilicon market declined sharply, due to large stocks and overcapacity for peace consumption. The leading producer did not enter the market during the year, producing only on old contracts. The price of 50 per cent ferrotungsten was $155 a ton, delivered, at the time of the armistice. By May the general quotation was $100, but prices were made on resale lots as low as $75 a ton. Resale alloy made the market a large part of the year. Some producers never quoted below $90 a ton, but actual business consummated from May on was at levels close to $80 a ton, delivered. In December the market was $80 to $85 a ton.

1919 Tin Plate Output Shows Falling Off

IN THE past 20 years, or since some attempt has been made to keep a record of tin plate production, there have been only two years when the output of the mills of the country has fallen behind that of the preceding year and 1919 was one of them. The explanation is simple and is to be found in the first place in the fact that the abrupt termination of the war left the container manufacturers with huge stocks of tin plate, which, of course, restricted new demands and production during the early part of 1919; and secondly, in the fact that no branch of the industry suffered more severely as a result of the walkout of the steel workmen on Sept. 22 as did the tin plate mills.

Just before the outbreak of the strike 95 per cent of the tin plate capacity of the country was in operation; at the end of the first week of the disturbance, less than 50 per cent of the mills were running. Although the recovery was pretty constant from then on, the end of November found them running only about 75 per cent full, while on account of the introduction of numerous green hands during the strike period, production was considerably out of line with the amount of capacity engaged. Then, the strike of the coal miners which had been on since Nov. 1, became a restrictive factor in production. Several plants, including some of those of the American Sheet & Tin Plate Co. and the independents were obliged to shut down in whole or in part because of the insufficient supply of fuel.

Labor disturbances could not have come at a worse time for the industry, for there probably was not a manufacturer in the country who, at the time of the steel plant strike was not sold ahead at least to Dec. 1, while some had obligations that would have required the last quarter of the year at a normal rate of mill operation to complete. It developed during the summer that packers had greatly underestimated the perishable food crops; this entailed a run on the can manufacturers, who in turn had underestimated their tin plate requirements and the rush to buy the latter was feverish and excited in the late summer as it was sluggish and restricted during the first half of the year.

Meet Demand From Stocks

Thanks to fairly generous stocks in the warehouses of the tin plate maker, which it might be said in some cases existed because of a desire on the part of manufacturers to keep their men at work over a dull period. these requirements were fairly well provided. But there was some accumulation of orders which could not be filled and on top of these were export sales of huge proportions, originating from every quarter of the globe where tin plate is used. It was estimated as early as the middle of November, before the strike of the coal miners was regarded as serious or that it would be productive of a curtailment of output, that the carryover of 1919 business into 1920, would be 8,000,000 base boxes. In view of the fact that several plants were obliged to suspend in December on account of the coal shortage, a further piling up of business resulted.

While the theoretic annual capacity of the tin plate mills of the country is approximately 40,000,000 base boxes, every plant in the country would have to run full every working day of the year to attain that mark. In the past, 90 per cent has been normal maximum capacity and in the past few years even that mark has been attained only for a few months. The prediction appears safe that few mills will complete their present obligations before the end of March and some probably will be working on old business even farther into the new year. Labor enters largely into any forecast of the immediate future of the industry. Though labor troubles at the mills were practically eliminated before the first of December, it must be recalled the supply of workmen was none too plentiful when the trouble started. Furthermore, foreign workmen, numerous in the tin plate mills, have left the country in

large numbers during the existence of the trouble.

It usually happens that when the industry experiences a lean year, as it did in the one just ended, the succeeding year makes up for it. When consumers experience a long period of short supplies, as they have in the past few months, they usually take care not to be caught this way again. With this prospect coupled with the large bookings now before them, 1920 gives promise as being a year in the matter of output and consumption as last year was small.

Not only did a big carryover of tinplate by manufacturers hamper business in the first half of last year and bring the operations of the mills to about 50 per cent of capacity well over this period but the fact that many packers of foodstuffs obeyed the injunction of the war industries board late in 1918 and laid plans for substituting paper and cardboard containers for tin ones, left most of them with big stocks of the substitute material. This consequently cut into tin plate demands.

Prices kept within a narrow groove during the year. The final meeting in December, 1918, between the price committee of the American Iron and Steel institute and the war industries board resulted in a price effective Jan. 1, 1919, of $7.35 per base box, Pittsburgh, for standard coke tin plate. This price was fairly well maintained on new mill business, but shaded considerably on resale material during the first three months. Then came another revision downward to $7 per base box, Pittsburgh, through the agreement of producers effected through the industrial board.

Though in the main, there was fairly general adherence by all makers to this figure, more or less tonnages were booked during the middle of the year at much below that figure. As low as $6.40 per base box then was accepted by some manufacturers, anxious to keep their mills going, but with the development of the demand from foreign countries and from the domestic packers who had not properly estimated their requirements, later in the year, the market stiffened to the scheduled price. Some export business was done late in the year as high as $7.50 and even $8 per base box, Pittsburgh. On Nov. 15, the American Sheet & Tin Plate Co. opened its books for first half business which it announced would be by allotment, due to its soldup condition and the same price also was named by the independent companies to regular customers.

Railroad Buying of Meager Proportions

ACTIVITIES in the rail market during 1919 fell into three well defined stages. The first of these was the production and shipment of large tonnages of rails on old contracts placed by the railroads in 1917 and 1918 and which had been held up by the need for steel for war purposes. The second development included the rail orders placed by the railroad administration and the controversy carried on by the railroad administration with respect to rail prices. The third phase of the year's activities included the arrangements into which the corporate owners of the railroads entered or proposed to enter with respect to rail tonnages to be delivered during 1920.

When the year started the mills were delivering tonnages on orders which had been placed at prices ranging from $38 to $45, and the effect of these deliveries, in conjunction with federal control, was to prevent new buying of size by the individual roads. In February, it became known that the railroads had indicated to the railroad administration that they needed a total of 530,000 tons of rails, and it was expected that these requirements would lead to the placing of heavy tonnages by the administration. But these expectations were doomed to disappointment as the railroad administration during the year placed orders for only 200,000 tons.

Base prices on standard rails at the beginning of the year were $55, mill, for bessemer, and $57 for open hearth. At the meeting of steelmakers with the industrial board March 21, the prices were reduced to $45 and $47, respectively. This price level aroused much complaint on the part of the railroad administration officials, who, on May 9, met the steel men and sought to show that the figures must be lowered. The steel men stuck by their guns, however, and asserted that costs made it impracticable to quote lower than $45 and $47. These prices remained in effect over the remainder of the year. There was some variation with respect to foreign business. On foreign inquiries, domestic rail makers for a time after March 21, quoted $5 a ton higher than the domestic market, but this advance was not obtained to any extent, until in the last quarter prices on export rails ranged up to $5 higher.

Toward the end of the year, when it seemed likely that the control of the roads would revert back to their owners, the latter took steps to provide for rail requirements over 1920. One of the first roads to distribute tonnage was the Pennsylvania railroad which placed 56,000 tons with the Bethlehem Steel Co., 88,000 with the Carnegie Steel Co., 30,000 with the Cambria Steel Co. and 12,000 tons with the Lackawanna Steel Co. This business was placed tentatively, to be canceled in case the roads were not returned to their owners; the prices were left to be fixed later.

Car orders during the past year fell off materially, total bookings running around 20,000. This is less than the total placed in any one of five months in the record year of 1918, and is approximately one-tenth of the aggregate number of awards in that year. With the exception of 3180 cars placed by the Canadian railroads in January, the first five months were exceedingly dull. In June, there was an increase in general bookings which continued until November, when orders again fell off. A feature of the year's buying was a preponderance of demand for tank cars; in fact the largest single order of the year was for 5500 of these cars, allotted in the last quarter. An order for 1400 tank cars was placed in July. In October, Belgium bought 1000 gondolas from the United States government.

Total car orders placed with the American builders by months, as compiled by THE IRON TRADE REVIEW for the past several years, are as follows:

	1919	1918	1917	1916
January	3,180	200	15,000	21,700
February	60	4,575	7,750	12,900
March	150	2,190	21,500	8,750
April	575	31,150	4,250	7,000
May	360	70,165	15,000	4,225
June	1,010	400	8,200	1,300
July	2,510	30,000	8,650	2,600
August	2,125	10,000	13,000	15,025
September	3,975	4,000	1,100	15,500
October	4,750	40,900	42,800	26,000
November	350	200	10,000	37,000
December	1,000	8,000*	1,000	19,600
Total	20,045	201,780	148,250	171,600

*Estimated.

Buying of locomotives was principally for foreign account. Out of more than 445 locomotives reported placed, 364 were for export.

Light rails were in poor demand early in the year but, along with other steel products, improved as the year progressed. On Jan. 1, the 3.00c, mill, price that had prevailed, was reduced to 2.75c. On March 21, the price was reduced to 2.45c.

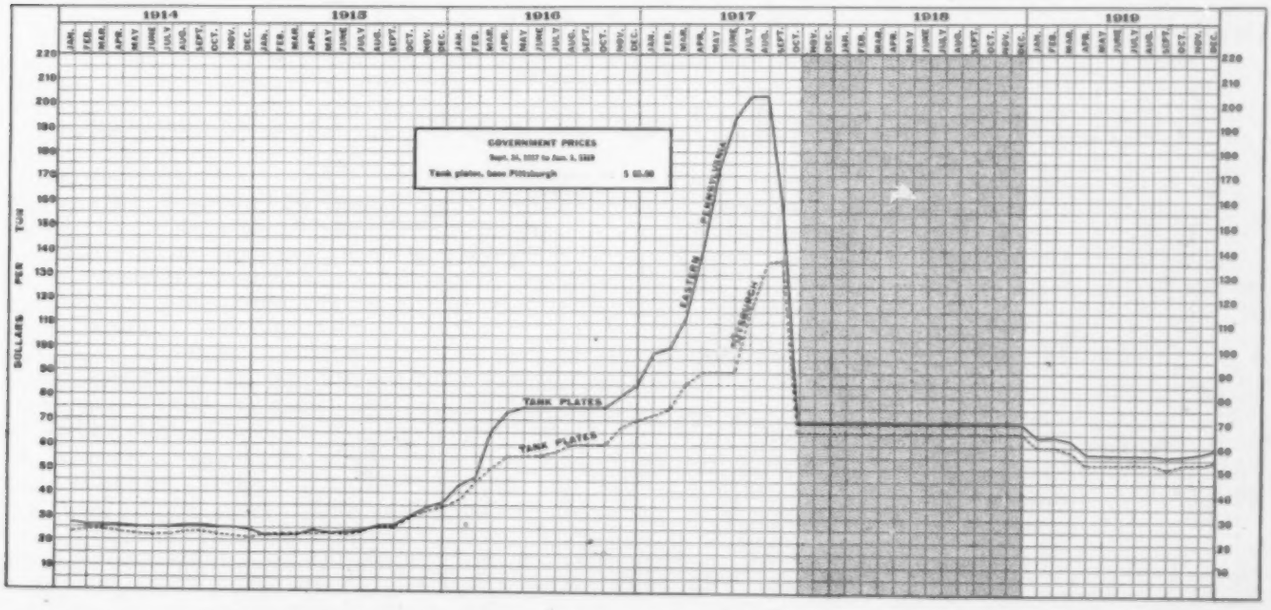
Plates Are Slowest to Respond

Lack of Railroad Buying Has Much Influence on Market in 1919—Strikes Bring About Shortened Supply and Stronger Prices Toward Year's Close —Foreign Buying is Important Factor

WHILE plates practically were the last of the important finished steel products to recover from the process of liquidation which stretched over a large portion of 1919, the strength which characterized that market in the latter part of the year is surprising when it is considered that productive capacity at the beginning of the year was practically 40 per cent greater than before the war. The great scarcity of plates which began to be felt in October and which prevailed during November and December was due largely to the extent to which the general steel strike interferred with production. However, demand for plates before the strike had shown such improvement that in August the market reports in THE IRON TRADE REVIEW from the various districts showed mills in the Chicago district to be running full, and with enough business on their books to keep them busy for several months. Mills in Ohio and, in some cases, in the Pittsburgh district, then were running full, and plants in the east, which were the last to benefit from the improved demand, were operating at around 60 per cent.

Thus there was evident a very real indication of the ability of plate makers to dispose of their output. Conditions that marked the close of the year were in marked contrast to those that obtained during the first half. When the year opened, the greater portion of the tonnage that the mills had on their books was in the form of orders from the Emergency Fleet corporation. While the bulk of this tonnage ultimately was delivered and accepted by the Emergency Fleet corporation, there was constant agitation as to the scope and effects of cancellations, abridgments and revisions of the ship contracts in which the various plate tonnages were involved. Consequently the plate mills at no time derived from the presence of these orders on their books the feeling of security that they would have had, had acceptance of the tonnages been assured. The mills also met with a great deal of discouragement in connection with foreign orders on their books. These foreign orders had been placed by various countries, some at the high prices which prevailed before the government undertook price control, and some at the quotations prevailing under the government schedule during the war. At any rate, while some of this tonnage was accepted, including some that had been placed at the high prices in 1917, there developed great pressure from abroad for the cancellation of most of these old orders. In many cases the mills accepted these cancellations, while in others cancellation was arranged subject to the payment of a penalty which, on at least some of these foreign orders, was fixed at $5 a ton.

In a good many cases cancellation of old tonnages was followed by the placing of new orders from the foreign buyers. Altogether, foreign buying was a big factor in the plate market during 1919. Export buying developed on a large scale in January and there was more or less export buying right along during the first half, coming mainly from Japan, England, Italy, France and to some extent from other countries, including China, India, Australia, South America, the West Indies, the Dutch East Indies, etc. In fact, American plates during the past year have been scattered broadcast over practically the entire world. Although there was good export buying right along through the first half, it was not until in the third quarter that the export demand reached its largest proportions. During that period all of the makers booked considerable export tonnage, and a number placed enough business on their books to take up their capacity through practically the remainder of the year During November and December large export tonnages were turned away by reason of the sold-up condition of the makers. Had it not been for the unfavorable exchange situation, export buying of plates would have been much larger during 1919. The extent of the requirements that were in mind



TANK PLATE PRICES PITTSBURGH AND EASTERN PENNSYLVANIA 1914-1919. SHADED PORTION SHOWS PERIOD ON GOVERNMENT CONTROL

is reflected in the inquiry that one responsible Italian buyer had out early in the year 300,000 tons of plates and 100,000 to 150,000 tons of shapes but which was not closed owing to exchange and credit difficulties.

Owing to the big tonnages that had been placed on books during the war, production of plates was large during the early part of the year. For instance, the Carnegie Steel Co. in March made a record by producing 138,800 tons of sheared and universal plates, which exceeded the previous high mark, in May, 1918, by 12,000 tons. But the halting character of domestic buying during the first quarter and to a large extent in the second quarter made it impossible for the mills to place new tonnage on their books at anything like the rate at which they were shipping. One reason for the slack domestic buying was the discouraging example of the government, and particularly the railroad administration and the navy department. Railroad Director Hines' refusal to recognize the prices that were established in March by representative iron and steel producers in conference with the industrial board of the department of commerce, and the hesitancy of the navy over placing battleship tonnages, did not tend to reassure the average buyer. In fact, the example of the government tended to encourage requests for concessions on the part of consumers, not only on the ground that prices were too high but on other claims. Some complaint was heard over the plate price, with reference to other prices; some consumers held that they ought not to be made to pay more for plates than for bars and shapes. However, the prices that were in effect both in the first and second quarters represented the lowest levels to which makers declared they could go with reference to costs. In fact, the mills buying their supplies of pig iron or slabs complained that the prices then prevailing returned them an actual loss.

Costs Delay Price Reduction

Due to cost considerations, eastern mills did not at once adopt the reduction from 3.25c to 3.00c, base Pittsburgh, which went into effect Jan. 1. There was very little shading of the 3.00c figure, although on some exceptional tonnage, including some round lots that were placed in the East for locomotive construction, 2.90c was done. In the Chicago district, some business was done at as low as 2.85c, Pittsburgh. After the meeting with the industrial board on March 21 resulted in a reduction of the plate base to 2.65c, Pittsburgh, shading for a time was at a minimum. One consumer, the Lukens Steel Co. in May advanced its price to 2.75c, Pittsburgh or mill, but this example was not followed. In the same month, with a good many mills operating at less than 50 per cent capacity, some business was done at concessions. During June some mills operated at as low as 20 to 30 per cent, and a good deal of the business that was taken went at 2.50c to 2.60c. The lower prices during those months prevailed especially on export business. It was in June that a real improvement in buying began to be noted in the West and in that month bookings by Chicago district mills were 50 per cent larger than in May. The improvement continued in the West until a number of the makers, by August, had enough business to run them practically at 100 per cent. But the improvement did not become noticeable in the East until July, when operations still were below 40 per cent in that district. It was not until the latter part of September, after the steel strike had started, that eastern operations approached a 100 per cent basis. While shading tended to disappear when plates became scarce, and export buyers were glad to pay the full price in November and December for such tonnage as they could pick up, some domestic business was done at 2.50c, Pittsburgh, as late as December. On the other hand, some mills in November and December were obtaining premiums and were turning away tonnage. Eastern mills at the close of the year were obtaining 2.75c, Pittsburgh, and in some cases 2.85c, was done. First quarter tonnages were placed with these mills at prices varying from 2.75c, Pittsburgh, to 2.90c, mill.

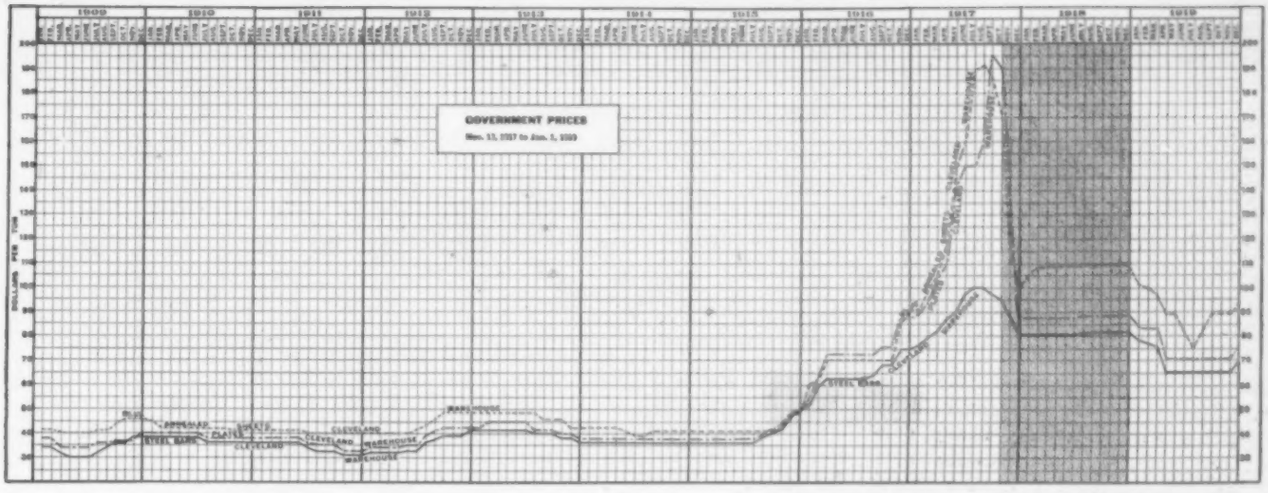
Outside of the Emergency Fleet corporation requirements which took up so much of the first half output, and the large export demands, a large part of the plate business placed during 1919 came from the oil companies and the various interests manufacturing tanks, boilers, etc., for the oil interests. Large tonnages of plates were placed by the shipyards and by the navy for battleships in the last half, a considerable portion going at the 2.50c figure. Considerable demand came from the railroads for plates for making car and locomotive repairs. There also was some fairly good sized tonnage placed in connection with orders for locomotives, to be made principally for shipment abroad. Demand for plates for new cars was not very large, excepting in connection with tank car business. One order alone, for 5500 tank cars which was placed by the Union Tank Car Co. in November, required a large tonnage. Plate mills generaliy at the close of the year reported a sustained heavy demand from all sources with the exception of the carbuilding industry.

Jobbers Unable to Keep Up Stocks

IRON and steel warehouses enjoyed excellent business during 1919. Difficulties experienced in obtaining material from the mills during much of the time caused consumers to fall back on store supplies for their immediate needs. A lowering of the margin of profit over mill prices also had an effect in stimulating buying from this source. The former custom had been for warehouses to quote $20 per ton higher than mill prices, with freight added. Under the revised plan the quotation was made $15 per ton higher than mill prices, with freight added, a direct cut of $5 per ton.

When the mills put into effect, Jan. 1, a lower schedule of prices than had prevailed late in 1918, the warehouses followed suit, reducing shapes and bars $4 per ton, plates $5 per ton and sheets $4 to $7 per ton under the final prices fixed during governmental regulation. When the mills made a further reduction in March, following the Peek-Redfield effort to regulate prices, the jobbers made an equal cut and at that time changed the margin of profit as previously mentioned.

The history of the warehouse trade for 1919 is one of adjustment to new methods of quoting. In May jobbers in the East adopted a new plan of quoting on shipments to consumers outside the large centers which was given a trial until November, when it was abandoned and the former practice resumed. This plan was to use the Pittsburgh mill price as a base and add the differential and freight from Pittsburgh to the consuming point. The former plan, which is again in general use, is known as the "equalizing" method. By its use two sets of quotations are in effect, one for the immediate territory served by a warehouse and the other on goods shipped into competitive territory which another center also can



PRICES OF LEADING WAREHOUSE PRODUCTS CLEVELAND 1909-1919. SHADED PORTION SHOWS PERIOD OF GOVERNMENT CONTROL

serve. In this case the difference between freights from the competing cities is added or subtracted, according to whether it is in favor of or against the seller.

As an illustration, Philadelphia stores at one period quoted 3.60c on iron and steel bars for contiguous territory. For competitive points, however, these products were sold at 3.50c, except where this figure was at a disadvantage with the prices of 3.52c and 3.48c at New York and Baltimore, respectively. Other products were on the same relative basis.

Fixed Prices Simplify Quotations

Another change was made during the last half of the year when the custom of selling shafting according to a schedule of discounts was abandoned and a fixed price was substituted. This tends to simplify quotations. In making the change the actual selling price was not altered.

During the strike in September and October when mill shipments were greatly interfered with, stores were drawn on heavily to meet the demands of consumers. The largest business of the year then was done by the jobbers.

The range of warehouse prices in the year is shown by the quotations on the commoner products at leading centers.

Exports Sustain Metal Markets

Heavy Demands From Abroad Partially Met, Despite Exchange Rate, While Domestic Requirements for Most Nonferrous Metals, Except Copper and Brass, Were Slack—Labor Troubles and Fuel Shortage Affect Sales

DURING 1919 the nonferrous metal markets shared fully in the general industrial readjustment to peace conditions. Government control of prices was relaxed on or before Jan. 1 in the case of all metals except tin, which continued under control until July. Immediately after the lifting of the restrictions prices began to drop, touching low levels in the early spring, then recovering a large part of this loss in accordance with the general industrial activity of the summer. In the autumn labor troubles and fuel shortages affected the markets, consumers hesitating to commit themselves, as they were in doubt as to the extent to which their own operations might be restricted. In line with the reduction in prices, operations were curtailed more or less sharply in various metals. A prominent factor in the metal markets during the last half of the year was the insistent demand of foreign countries for lead and zinc, which was partially met despite the adverse exchange rates, and which sustained the domestic markets when domestic demand was extremely slack. There was also a heavy volume of foreign copper requirements, only a fraction of which were satisfied, owing to the depreciation of foreign currencies as measured in dollars.

To control the foreign sale of American copper, the Copper Export association was formed about the beginning of 1919, representing about 90 per cent of the country's copper producing capacity. The association maintained the domestic price on export business. The domestic market opened the year at 23 cents, where it was maintained by the producers for two months. Second hand sellers, however, offered supplies at concessions of 1 cent to 2 cents a pound, down to 21 cents, New York. In February the producers began to meet outside competition and the price was scaled down to below 15 cents. At this level, however, consuming interest was stimulated and during April, May, June and July a heavy business was booked, the total bookings for these four months exceeding 400,000,000 pounds. During this period the producers disposed of the government stocks of copper, which, it had been feared, would depress the market.

By June the market recovered, producers marking their prices up to 23.50 cents in August. Then second-hand sellers regained control of the market, selling copper and taking their profits, while producers maintained their asking price and took little business. In November the producers again met outside competition and prices were marked down to 18 cents, where consumers again became interested. At this time, however, producers were extremely cautious in making sales only to consumers, to prevent speculators from regaining

Average Monthly Nonferrous Prices in 1919

PROMPT, WHOLESALE LOTS, CENTS PER POUND

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec. to 20th
Spots straits tin	69.92	68.10	68.97	72.50	72.50	71.00	70.39	60.76	55.76	55.87	54.11	53.87
Electrolytic copper, New York	20.45	16.96	15.03	15.39	15.68	17.75	.....	23.50	22.03	21.65	20.13	18.45
Lead, New York*	5.48	5.11	5.26	5.03	5.00	5.37	5.71	5.81	6.09	6.49	6.92	7.01
Zinc, prime western, St. Louis	7.10	6.35	6.19	6.19	6.11	6.54	7.59	7.55	7.21	7.49	7.84	8.33
Aluminum	33.00	33.00	33.00	33.00	33.00	33.00	33.00	33.00	33.00	33.00	33.00	33.00
Antimony, spot, New York	7.50	7.21	6.80	6.70	7.45	8.40	8.85	8.95	8.51	8.56	9.10	9.55

*Outside market.

their previous acendancy in the market. Stocks of refined copper held by producers were extremely heavy during the year, but these were held against the expected foreign requirements, especially of Germany and the continent. The foreign business was held back because of the credit situation, and the failure of the peace treaty was a heavy blow to the market, temporarily.

Demand for copper and brass products was good throughout 1919, except for seamless tubing and brass rods, capacity for producing which descriptions was greatly expanded during the war. Stocks of rods and tubes held by the makers and the government also weighed on the market.

The zinc market was depressed during most of 1919, but production was drastically curtailed after the middle of the year, when not more than one-third of the available retorts were operating. The British and Belgium industries were unable to produce in competition with American smelters at current producing costs, and despite the low foreign exchanges a heavy tonnage of zinc was sold for export. The steel strike and the coal strike repressed buying by galvanizers, while large government stocks of grade A zinc supplied a large part of the requirements of the brass mills. Prime western sold within a range of 7.50 to 8.50 cents, East St. Louis basis, during most of the year, but the market was strong toward the close of the year.

The lead market was held at 8.05 cents, New York, toward the close of 1918, under government control, but with the lifting of this control, the price dropped as low as 5 cents, New York, in May, 1919. It quickly recovered from this level to 5.50 cents in July. Later, strikes in certain smelters, also in the Coeur d'Alene producing field, in Idaho, strengthened the domestic statistical situation. Then serious strikes in Spain and Australia curtailed world lead supplies, forcing a strong London market and correspondingly advanced the American price, so that by December lead sold above 7 cents, New York.

Tin was the subject of further agitation during much of the year. The war industries regulations maintained the fixed price of 72.50 cents on Straits and Australian tin up until July, to enable consumers and the government agent, United States Steel Products Co., to dispose of the high-priced tin. During this time the world market dropped to 50 cents, but the war trade board did not permit imports of this low-priced tin until the government tin was disposed of. After the control was lifted, the price gradually declined to around 50 cents, New York, whence it gradually recovered to around 55 cents. The markets at London and in the Far East were extremely strong, but the steady drop in the price of the pound sterling enabled American tin consumers to buy tin much more cheaply than English consumers. The government allowed a rebate to consumers who bought government tin at 72.50 cents, amounting to about 3 cents a pound. Little Chinese tin came into the American market during the year and much of the Banca and Billiton tin produced in the Dutch East Indies was bought by Germany.

The antimony market was affected by the increase in the cost of silver, which increased the Chinese exchange rate on the United States, China being on a silver basis. However, antimony sold much of the year at prices asserted to be below the cost of production in China.

The aluminum market suffered but little from foreign competition during 1919, although little European metal was brought in at prices a shade under the American quotation. The producer took contracts for No. 1 virgin metal during the year at 33 cents.

The beginning of the past year found most nonferrous metals recovering from their bonds of government control and from the specilization that accompanied war industry. Copper began its freedom with the calendar year but 12 months have been insufficient to remove the evidence of federal control. Even today the market is dominated by an excess of metal. When the end of fighting came, a good amount of metal was on hand and in process of being refined, while production was near its highest record. This rate of output the government encouraged the producers to continue, as it was understood Europe would take enormous quantities, being supposedly at the starvation point for the red metal. It was not until well into the new year that curtailment really became effective. Lead and zinc have enjoyed free markets all year, though for many months war stocks bothered the latter. Aluminum was freed early in the year but little change has been noticeable. Tin was the one metal under real control, the embargo on imports being enforced rigidly. The average monthly prices of lead at New York from 1914 to 1918 are as follows:

	1914	1915	1916	1917	1918
Jan.	4.00c	3.50c	5.60c	7.50c	6.70c
Feb.	3.80	3.70	6.00	8.30	7.00
March	3.80	3.80	6.50	8.30	7.30
April	3.70	4.00	7.40	8.30	7.10
May	3.70	4.50	7.40	9.00	7.00
June	3.70	5.50	6.80	10.00	7.30
July	3.70	5.50	6.50	10.50	8.00
Aug.	3.70	4.50	6.00	10.60	8.00
Sept.	3.70	4.40	6.50	8.50	8.00
Oct.	3.60	4.40	6.80	6.50	8.00
Nov.	3.60	5.00	6.80	6.00	8.00
Dec.	3.70	5.50	7.50	6.00	6.812

The average monthly prices of prime western zinc at St. Louis from 1914 to 1918 are as follows:

	1914	1915	1916	1917	1918
Jan.	5.20c	6.30c	18.00c	9.70c	7.73c
Feb.	5.40	8.50	19.50	10.10	7.750
March	5.30	10.00	18.00	10.60	7.50
April	5.20	11.50	18.30	9.80	7.50
May	5.10	15.50	15.50	9.30	7.12
June	5.00	22.50	12.50	9.00	7.79
July	5.50	21.00	9.50	8.70	8.41
Aug.	5.50	14.40	8.60	8.30	8.67
Sept.	5.00	14.40	9.00	8.00	9.29
Oct.	5.00	14.00	10.00	7.90	8.77
Nov.	5.00	16.70	11.50	7.70	8.50
Dec.	5.50	16.60	11.00	7.60	8.089

The average monthly prices of spot Straits tin at New York from 1914 to 1918 are as follows:

	1914	1915	1916	1917	1918
Jan.	37.60c	34.30c	42.00c	44.00c	88.80c
Feb.	40.00	37.40	42.50	52.00	96.5
March	37.50	48.70	50.40	55.00	94.5
April	35.50	48.00	52.00	56.00	92.0
May	32.50	38.70	49.50	63.50	105.0
June	30.70	40.30	41.50	62.30	93.0
July	31.50	37.00	38.50	62.50	98.0
Aug.	30.50	34.00	38.50	62.80	86.1
Sept.	32.50	33.20	38.70	61.80	81.1
Oct.	30.40	33.00	42.00	62.00	80.35
Nov.	33.50	39.20	44.00	74.40	74.0
Dec.	33.50	38.50	42.60	88.40	71.226

Structural Work Forges Ahead

After Marked Hesitation During First Several Months of Year, Builders Release Contracts More Freely and Steadily Rising Tonnage of Awards Follows — Plain Material Prices Steady—Must Shape Capacity be Extended?

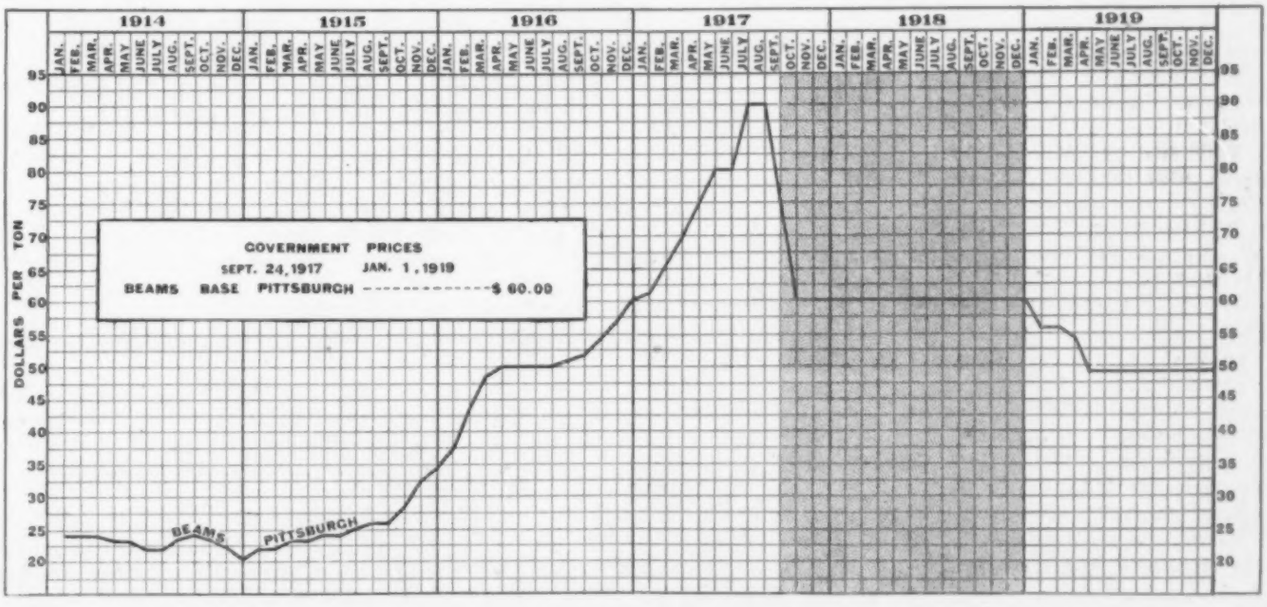
STRUCTURAL shape mills and fabricating shops began 1919 with a large amount of work on their books that in most cases had been taken prior to the armistice. Operations at the beginning of the year, therefore, were on a satisfactory basis. However, work on many government contracts was held up or canceled, and new work flowed onto the books of both the mills and fabricating shops in much smaller volume than the tonnage shipped. In fact, many in the industry declared that the stagnation with respect to new business was without precedent in their history. The result was that the shape mills even as early as January were having trouble to balance their schedules, while operations at fabricating shops in many cases had gone to a basis of 70 per cent, or less, of rated capacity by the end of the month.

Due to the extent to which structural activities had been restricted during the war, building projects were brought out in large volume early in the year, and there was considerable agitation among public officials to urge prospective builders to carry out their plans and thus aid in stimulating business. But, as in practically all other lines, there was a feeling of pronounced hesitancy among builders, and, from the standpoint of structural bookings, the totals placed in January and February were the smallest on record. The tendency to postpone buying was based to a large extent on the expectation that prices on all kinds of building materials would recede. The reduction in the price on plain shapes from 3.00c, Pittsburgh, to the 2.80c, base which became effective Jan. 1, did not meet expectations, so that when, as a result of the conference between the steelmakers and the industrial board of the department of commerce in March, the base price of shapes was put down further to 2.45c, Pittsburgh, it was expected that there would follow a stimulation in demand.

Unfortunately, business uncertainty continued, and it was aggravated by the example of the government, and particularly the railroad administration, which insisted on lower prices than those established at the March meeting. Other discouraging factors were the failure of congress to pass the $750,000,000 railroad and the $800,000,000 naval appropriations. It was not until after the meeting of steel manufacturers with representatives of the railroad administration in New York on May 9, when the steelmakers reaffirmed that the prices that had been established in March, represented the lowest level at which they could sell, that consumers began to feel some assurance with respect to the market. The tendency toward improvement in buying which heretofore had been barely perceptible, became more apparent after that date.

To such an extent did the demand grow that mills which in the second quarter had been operating at 25 to 50 per cent, early in September were producing at 75 to 90 per cent, and many of them at that time were closing rollings three to four weeks ahead. When the steel strike became effective on Sept. 23, therefore, there speedily developed a scarcity of shapes. The mills that were untouched by the strike soon found their order books filled with orders to overflowing. At the close of the year all of the makers had as much business as they cared to take and mill schedules were pretty well mapped out for two months or more ahead. During December the mills turned away more orders than they booked, and at least some of the mills wound up the year with enough tonnage on their books to occupy them through most of the first half. Despite the heavy demand in the fourth quarter, however, production at many mills because of indifference of the workmen, was at a rate averaging around 80 to 90 per cent of rated capacity.

Prices that were quoted during the year varied less in accordance with



STRUCTURAL SHAPE PRICES 1914-1919. SHADED PORTION SHOWS PERIOD OF GOVERNMENT CONTROL

market conditions than was the case with some other steel products. Early in the year there was very little shading and toward the end of the year producers were making no effort to get the last possible dollar out of consumers. Practically the only shading in the plain shape market was in connection with several large battleship tonnages which were sold to the navy department at 2.40c, Pittsburgh, and considerable tonnage of ship shapes which was sold to private yards at the same price. Sales of ship shapes to the shipyards at 2.40c, continued to be made during the period of scarcity toward the end of the year, thus reflecting a desire on the part of the makers who booked the business to foster the trade of the shipbuilders. Toward the end of the year, when favorable deliveries were hard to get, there was a disposition on the part of some of the smaller mills to take premiums, but these premiums did not exceed $2 to $3 a ton, and they were asked largely because of the advancing prices on pig iron and scrap, causing, in turn, a higher steel making cost at these mills.

During the war many new manufacturing plants in various lines of industry were erected, and existing plants in many cases were expanded on a large scale. In view of this situation, it is surprising to note the extent to which the structural steel industry was called upon in 1919 to furnish tonnage for new industrial buildings. In fact, such requirements constituted a large part of the structural work placed during the first half of the year. The following list of the most important lettings of the year indicates the extent to which industrial projects figured:

Naval ordnance plant at Charleston, W. Va., 24,000 tons, to American Bridge Co.

Warehouse for Butler Bros., Chicago, 9750 tons to Bethlehem Steel Bridge Corp.

Buildings at Mare Island navy yards, 6500 tons, to American Bridge Co.

Weirton Steel Co.'s plant, Weirton, W. Va., 15,000 tons to McClintic-Marshall Co.

Michigan boulevard plaza and approaches, Chicago, 5250 tons to American Bridge Co.

Office building for General Motors Corp., Detroit, 14,000 tons to American Bridge Co.

Kelly-Springfield Tire Co.'s plant at Cumberland, Md., 8000 tons to McClintic-Marshall Co.

Cunard Steamship Co.'s office building, New York, 11,000 tons, to Post & McCord.

Hanna building, Cleveland, 6000 tons, to American Bridge Co.

Seiberling hotel, Akron, O., 7000 tons to Thompson-Starrett Co.

American Rolling Mill Co., Middletown, O., plant extensions, 5000 tons, to American Bridge Co.

Goodyear Rubber Co. building at Los Angeles, 5000 tons, to Burger Iron Works.

Building for Citizens Savings & Trust Co. and Union National bank, Cleveland, 20,000 tons, to American Bridge Co.

Hangar at Lakehurst, N. J., 8350 tons, to Bethlehem Steel Bridge Corp.

Foundry buildings for Henry Ford, River Rouge, Mich., 20,000 tons, to American Bridge Co.

Power plant for Duquesne Light & Power Co., 5600 tons, to American Bridge Co.

Baltimore & Ohio bridge over Allegheny river, 5500 tons, to American Bridge Co.

Loft building for Regent Construction Co., New York, 5000 tons, to Hay Foundry & Iron Works.

Plant extension for Tata Iron & Steel Co., Janshedpur, India, 20,000 tons, to McClintic-Marshall Co.

Union Shipbuilding Co., Baltimore, extension, 5000 tons, to McClintic-Marshall Co.

Buckley building, Cleveland, 5000 tons, to Fort Pitt Bridge Works.

Atlantic Refining Co., Philadelphia, office building, 6000 tons, to American Bridge Co.

A feature of this list is the extent to which the Middle West is shown as a big tonnage field, in 1919, and the comparative lack of big tonnage lettings in New York.

Export Demand is Active

Outside of the tonnages taken by the fabricating industry and the jobber there was a continued active demand for shapes for export. This included both ship and structural shapes. In the first half some export tonnage was booked at concessions, but in the latter part of the year it was necessary for exporters to pay full prices or premiums, while in many cases they were unable to obtain material. The unfavorable exchange rates prevented the consummation of a great deal of business during the first half of which otherwise would have been placed. The shipbuilding industry at home was a big buyer of ship shapes during the last half.

Throughout the first half there was sharp competition for structural business. This is well illustrated in connection with one project, involving about 2500 tons, that came up in February; no fewer than 65 contractors submitted bids on this job. During the second quarter and part of the third, a great deal of the business taken by fabricators was accepted at as low as $70 to $80 a ton, delivered at such centers as New York and Cleveland. As late as September some business still was going at this level although later the market stiffened. During the year fabricators were asked to figure on an immense quantity of work; many fabricators said that the tonnage on which they put in bids exceeded anything they had known before. Of this tonnage a very large percentage was postponed. One large interest estimated that during the second and third quarters it submitted bids on projects, since shelved, involving a total of 600,000 tons. A great deal of tonnage brought out during the past year undoubtedly will be revived in 1920. The fabricating industry in Chicago was hindered during a considerable period by a building trades strike and lockout, later by the steel strike and still later by a strike of local fabricating shop operatives. Structural bookings during the last half of 1919, despite the depressing influence of strikes, exceeded those of any similar period in the preceding two years. This revival was especially notable in view of the fact that railroad buying was at a minimum, and, too, when the more extensive use of reinforced concrete in building is considered. Monthly bookings by the fabricating shops of the country, as reported by the Bridge Builders and Structural society follow:

	1919	1918	1917	1916
January	21,600	95,400	119,000	119,000
February	22,500	99,900	106,000	129,000
March	32,300	84,600	122,000	175,500
April	48,100	115,200	110,000	125,000
May	88,200	108,000	102,000	137,000
June	117,000	100,800	85,500	100,000
July	133,200	209,700	74,700	83,600
August	141,000	102,000	68,400	110,000
September	141,000	108,000	52,200	99,000
October	139,500	77,400	110,700	133,500
November	124,200	48,700	138,600	134,000
December	145,000*	52,270	205,200	148,000
Total	1,154,400	1,201,970	1,294,300	1,493,600

*Estimated.

A point which was raised in some quarters during the year perhaps has some significance with respect to possible future expansion of the shape rolling capacity in this country. Some well-informed steel men, feeling that shapemaking capacity had not been expanded in proper ratio with the tremendous expansion in plate capacity, predicted a great scarcity of the former product with resulting high prices. In connection with this prediction, it was argued that there might develop some importing of shapes from England. This opinion was held despite the fact that numerous small tonnages of shapes were exported from this country to England during 1919.

Sheet Demand Brings Famine

Disturbance of Production by Strikes Finds Producers With Heavy Order Books and Intensifies Shortage of Material—Automobile Industry is Biggest Factor in Year's Market—Late Prices Show Big Spread

DESPITE the fact that 83 new mills are under construction and due to start operations this year, it cannot be said the prospect, for ample supplies of sheets, at the outset of 1920 is promising. The manufacturers start the new year with obligations of about 1,250,000 tons, with plant operations still feeling the effects of the coal shortage produced by the miners' strike, and with many independent mills which buy their steel, having trouble in getting sufficient supplies. This latter situation largely is due to the increasing inclination of steel producers to add to their finishing departments and use a larger percentage of their ingot output than formerly. Furthermore the supply of labor is neither plentiful nor particularly efficient.

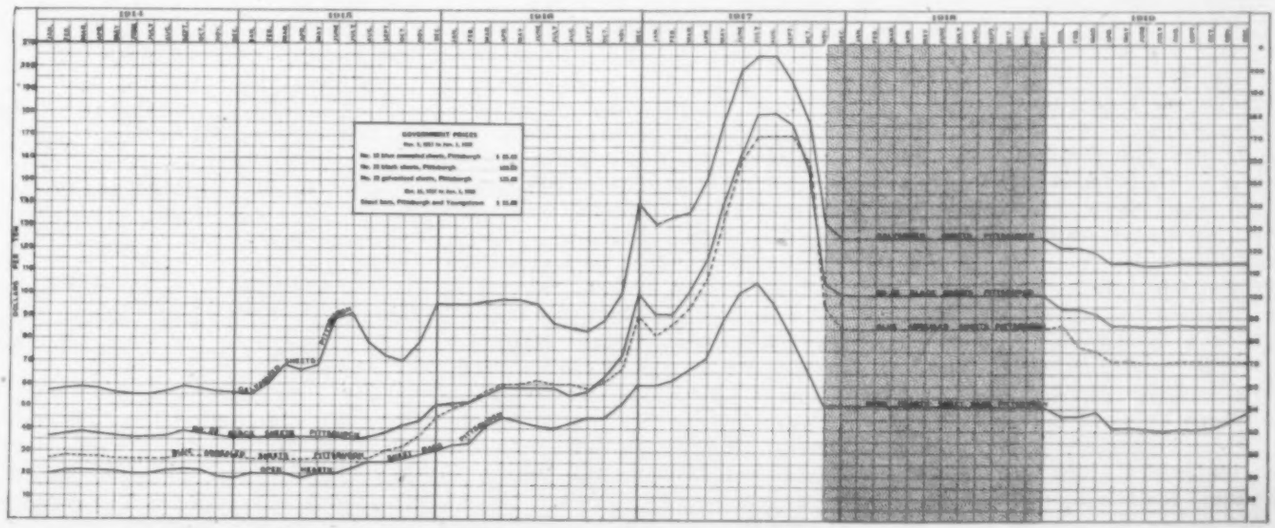
While the production of the new mills now under construction would add roughly about 40,000 tons to the monthly capacity of the country, it is a fact that none of these mills yet has arranged for its steel supplies. Because of the tendency toward contraction of open market offerings of sheet bars, as well as all forms of semifinished steel, it is possible that some of this capacity may not get into operation, or if it does, that it will be upon a basis of high costs for raw material. The fact that the strike of the iron and steel workmen was a failure and that the men largely are back on the job does not solve the labor problem; it is a fact that labor was somewhat scarce even before the trouble developed and the total supply has been much lessened in the period of the disturbance through the exodus of foreign workmen from the country.

Foreign labor, not only is largely employed in sheet mills, but is an extremely important link in the working force of every mill, in that it performs the ordinary and less remunerative tasks. Caste is strong in the ranks of labor. The man who has learned a trade or particular branch of it, is not easily induced to do unskilled work in a plant even though it may pay as well. Virtually it is trying the impossible to attempt to get a skilled or semiskilled workman to do ordinary labor. Moreover, the ranks of the latter class have been seriously thinned in recent years and especially since the outbreak of the war.

Demands of the great conflict on the steel industry made it possible for the laborer to rise to the semiskilled and even skilled ranks and once in either class, there was no return to the more onerous tasks for the individual thus benefited. Immigration, on which the country is largely, if not entirely, dependent for its supply of common labor, has been on a steadily declining scale for the past five years and even the fact that more than a year has elapsed since the ending of the war, no accessions of foreign workmen worthy of note have occurred. On the contrary, thousands of foreign workmen, who stayed in this country to earn the big wages that were obtainable or to escape military service, have returned to their native lands in the past year.

To overcome the handicap of backed-up orders for various kinds of sheets, due to the steel and coal strikes, which would require from two and one-half to three months of full operation of all the capacity now available to complete, and at the same time to produce the normal requirements of the year, seems, and probably will be, impossible under the circumstances. While the American Sheet & Tin Plate Co., which roughly produces about 40 per cent of the sheets made in this country, succeeded in getting more than 90 per cent of its mills in operation with the decline of the steel strike, actual production was well under that mark. The same condition existed with the independent manufacturers, who, before the coal strike became a restrictive factor in production, had close to 90 per cent of their capacity in operation.

Neither full plant operation, nor 100 per cent efficiency can be expected, however, for the reason that the labor supply, both skilled and common, is not adequate. The sheet industry has lost its quota of foreign workmen and it might be added, also many of the men who came out of the offices and from off the farms to work in the steel mills during the



PRICES OF SHEETS AND SHEET BARS 1914-1919. SHADED PORTION SHOWS PERIOD OF GOVERNMENT CONTROL

war. The strike made necessary the introduction into the mills of workmen without previous experience, whose greenness is likely to keep more than one plant from immediately reaching the point of high efficiency. Working off the accumulation of business, consequently, is likely to be a matter of more than two and one-half or three months.

Prosperity in the automotive industry saved the sheet business in the early part of the year from sharing in full the dullness which characterized the finished steel market as a whole pretty much over the first five months of 1919. When users of sheets of other grades, were extremely sparing buyers in the fear that prices might go lower and that they would be caught with high-priced stocks, the automobile builders were pressing for deliveries against unfilled orders and were placing new contracts in the effort to bring back pleasure and commercial car production to normal proportions. Even in June, when general business began to mend, the sheet manufacturers had as much business in automobile material as in all other finishes combined.

It was the automobile manufacturers who showed the way in the improvement in the steel business, which began to develop in June. At the outset of that month the General Motors Corp. covered on its requirements for the year ended July 1, 1920. These included about 50,000 tons of sheets, beside tubes, bars and other lines, which brought the aggregate order to around 350,000 tons. Other large automobile companies were not far behind in placing their requirements. Incidentally, it may be mentioned that not a few of the new sheet mills now under construction based their decisions to expand on the demands of the automobile industry. Likewise much of the structural business which was placed during 1919 was directly or indirectly due to the prosperity and expansion of that line of production.

The year of 1919 will not be looked back upon with pleasure by the makers of sheets. Not only did they have much competition from offerings of steel left over when the war machine was halted, but they also then had to contend with an ingrained belief in the minds of buyers that since the war was over, prices should seek peacetime levels. While much of the early wartime inflation of the market had been squeezed out by the fixing of prices by the war industries board in conjunction with the American Iron and Steel institute in September, 1917, buyers seemed to have overlooked this fact. The reduction from the prices in effect in the last quarter of 1918, of $6 per ton in black sheets, $4 in galvanized and $7 in blue annealed, effective Jan. 1, 1919, and which all manufacturers applied to unfilled as well as new business, failed to generate confidence among buyers.

They continued to exercise considerable caution in their purchases even after the meeting between representatives of the iron and steel industry and the new industrial board at Washington in March had resulted in a further reduction of $7 per ton in all grades. This cut put black sheets, both sheet and tin mill, at 4.35c, base, Pittsburgh, galvanized at 5.70c, and blue annealed at 3.55c. Still is was the orders for automobile sheets which were keeping the mills going for the most part. The leading interest adhered closely to these prices through the period of dullness and uncertainty produced by the Hines-Peek controversy.

Some of the independent companies, however, faced the danger of losing their working organizations through the lack of sufficient orders to provide steady employment. Although buyers at the time were beginning to evince the first sign of interest they had taken in several months in the market, these producers instituted a selling campaign, in which they shaded the industrial board schedules as much as $4 to $7 per ton. Some business in galvanized sheets was taken by them as low as 5.40c, base, in black sheets as low as 4.15c and in blue annealed down to 3.30c. However, this business helped to fill up these mills and before the second half of the year had progressed far every maker in the country was booked well toward the end of the year.

Unfilled tonnage figures provide a graphic picture of the trend of business during the year. Uncompleted bookings of the American Sheet & Tin Plate Co. for estimating purposes may be figured to be about 67 per cent of the combined figures of the independent manufacturers. Unfilled independent tonnage in December, 1918, was around 360,000 tons; in January, 1919, it was 344,000 tons, in February 298,000 tons, in March 233,000 tons, in April 177,000 tons, in May 174,000 tons, in June 272,000 tons, in July 372,000 tons, in August 446,000 tons, in September 501,000 tons, in October 490,000 tons and in November 541,000 tons, while the December figures showed a backed up business of over 600,000 tons. In view of this sold-up condition a virtual famine of sheets developed in the closing months of the year. Premiums were freely offered and paid by consumers, in some cases reaching $10 to $20 per ton. Most of the mills however, awarded this kind of business and following the example of the American Sheet & Tin Plate Co. were accepting first half contracts from regular customers at unchanged price.

The American Sheet & Tin Plate Co. on Nov. 15 opened its books for first quarter and first half of 1920 business and named the March 21, bases. It announced, however, that because of the condition of its order books, due to the strike, it would be obliged to allot its production for the entire six months and that it could do nothing for other than its regular customers. Independent sheet makers also have named the old price bases on first quarter business, but the scarcity of early tonnages, because of the strike made some buyers so anxious to secure supplies that they regarded the price as secondary. Some business has been put on the books of certain companies carrying premiums over the regular prices of from $9 to $16, black sheets having sold as high as 5.00c, base, galvanized up to 6.50c, base and blue annealed to 4.00c base.

It is stated, however, that the amount of such business is small in comparison with the whole and the circumstances are that high prices have been quoted purposely to discourage the purchase which in some cases has failed to produce the intended result. The industry as a whole believes that this is not the time for higher prices and that the restoration of normal conditions will be hastened by keeping speculation at a minimum.

New sheet mills completed during the past year number 22, and 83 now are in course of building. The additions to the list of steel mills now in service included 10 mills for the Massillon Rolling Mill Co., Massillon, O., eight mills for the Whitaker-Glessner Co., Beach Bottom, W. Va., two mills for the Allegheny Steel Co., Pittsburgh, and two mills for the Apollo Steel Co., Apollo, Pa.

Extensions now under way include 12 mills for the Eastern Rolling Mill Co., Baltimore, Md.; 12 mills for the American Rolling Mill Co., Middletown, O.; 10 mills for the Bethlehem Steel Co., Sparrows Point, Md.; 10 mills for the Follansbee Bros. Co., Toronto, O.; eight mills for the Falcon Steel Co., Niles, O.; eight mills for the Superior Steel Co., Canton, O.; eight mills for the Newton Steel Co., Newton Falls, O.; six mills for the Aetna Iron & Steel Co., Gary, Ind.; six mills for the Mansfield Sheet &Tin Plate Co., Mansfield, O.; two mills for the Cannonsburg Steel & Iron Works, Cannonsburg, Pa.; and one mill for the Otis Steel Co., Cleveland.

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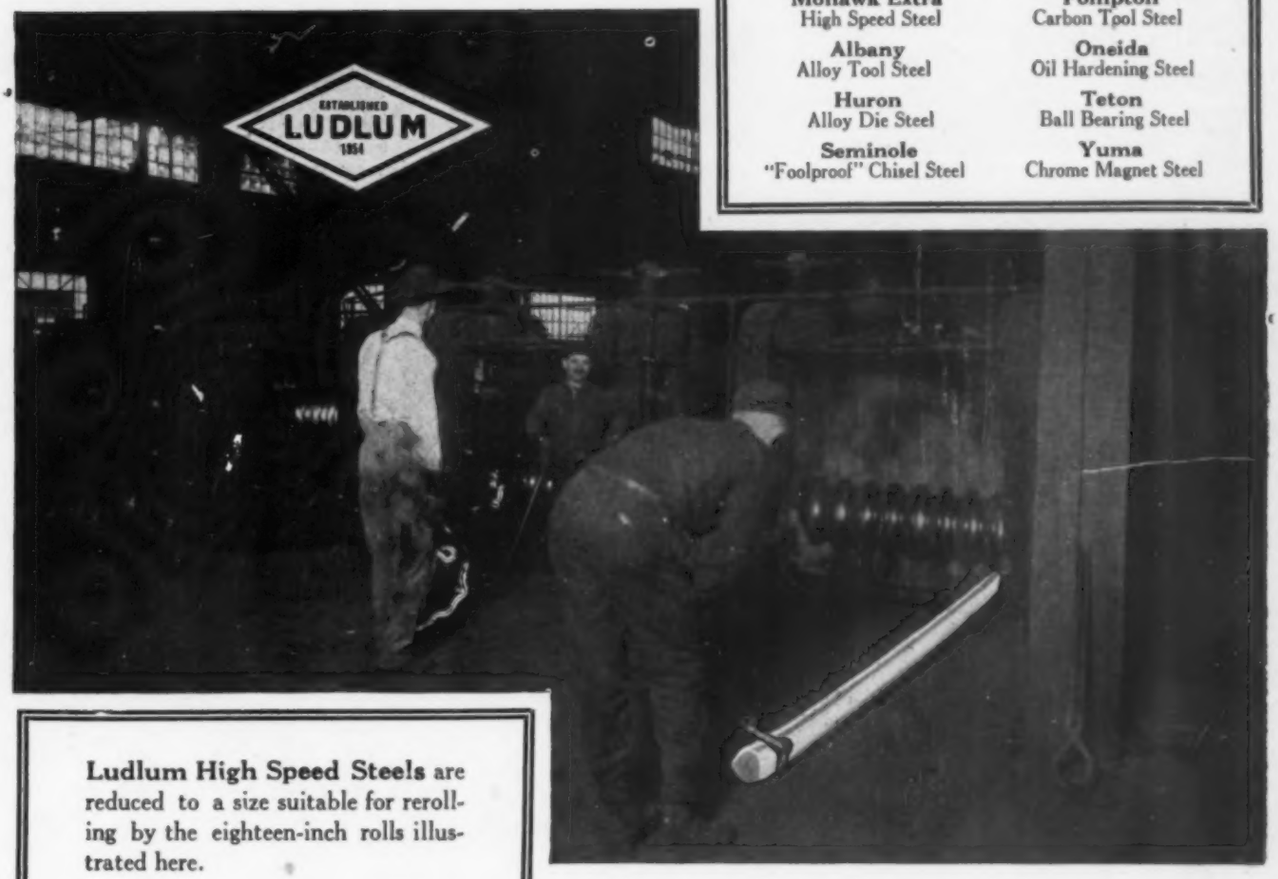

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Scrap Survives Peace Uncertainty

Fluctuations of Year Trace the Development of Confidence and of Productive Activity in Steel Industry—Government Tonnage Fails to Prove Market Deterrent That Was Expected—Large Transactions Are Closed

TOUCHING as it does steel mills, iron mills, rerolling mills, foundries and blast furnaces as a raw material, scrap iron and steel had a varied experience in 1919 in meeting the novel conditions of an unusual readjustment period. Probably no other raw material has so wide contact with the entire iron and steel industry as scrap. Its market is essentially primitive, its value based on no cost save handling and transportation and dependent entirely on its relative supply applied to the demand of its consumers.

Thus the unusual conditions that successively touched the several departments of the steel world were reflected in a varied way by the scrap market. When it was supposed the government had vast supplies of scrap to be disposed of, the market was heavy. When the real tonnage was disclosed and demand was sufficient to absorb it without a glut, reaction came in an equal degree.

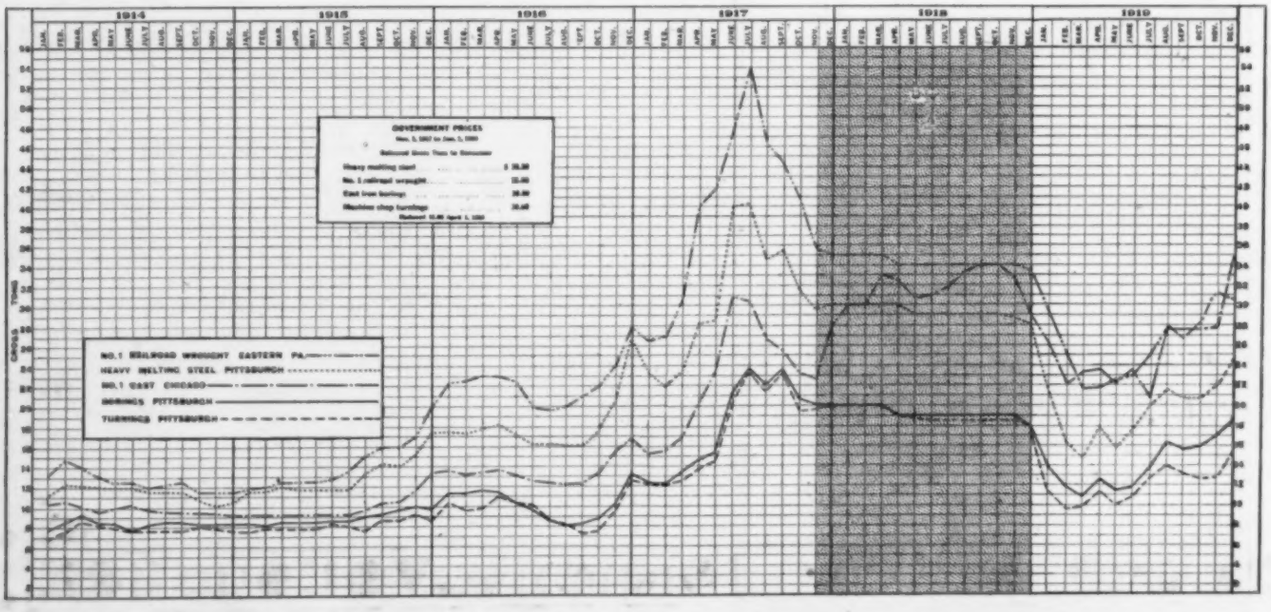
When the railroads bought practically no bar iron, wrought scrap was a drug but later when steel bars were scarce, many users sought iron as a substitute, and that department of the industry was reserved. When pig iron became scarce and deliveries were interfered with by strikes at blast furnaces, cast scrap passed the former metal in price. Thus the procession of events in other departments all found their reflection in scrap and in a way that no other commodity is effected. Scrap is so widely diffused as to source and handled by so many channels, and is utilized in so many ways that it possesses a sensitiveness to external influences not common to other materials.

The year opened with every element of uncertainty bearing hard on the scrap market. Nobody knew what to expect. It was supposed the government had immense tonnages of material which would be placed on the market in due time. Buyers believed they would be able to stock up on cheap scrap from this source and scorned other offerings. Prices crumbled and dealers were wary. Heavy melting steel reached $18 to $19, delivered, a low figure compared with the $29 fixed by the government during the war. In February some of the government shell steel appeared and this was taken as the first trickle of the flood that was to follow. Some heavy melting was sold at $11 in New York, and at $15 in Pittsburgh. The general level was $14 to $15.

Although steel mills did not feel the uplift of demand until much later, the scrap situation began to pick up when the year was less than 60 days old. Dealers having sized up the situation, found their difficulties much less than they had imagined. The first improvement came in cast scrap as foundries began to seek material. Some steel mills found scrap cheaper than hot metal from their own stacks and bought heavily. The Bethlehem Steel Co. took all the heavy steel it could get up to $14.50, finding sellers for a heavy tonnage. Through March the tendency was upward in spite of the handicap caused by uncertainty during the deliberations of the industrial board in its endeavor to stabilize prices.

In spite of the cut in steel and pig iron prices March 21, scrap did not go backward. Dealers had formed the opinion government accumulations was a bogy not to be feared and began buying steel to throw down in their yards. Many bought to the limit of their resources and credit. In April buyers showed more interest and heavy steel advanced to $16.50, but when the mills had completed their purchases this price receded somewhat. In May it was back to $14.50. Steel in yards did not move, however, as dealers were convinced it was worth more. The government announced in May that it had 453,000 tons of steel scrap to be sold under sealed proposals and for a time this blanketed the market. This effect wore off soon, as this war material was moved readily and in June buying was resumed briskly with an instant reaction to $16.50 for heavy steel. Dealers were more than ever convinced of the strength of the market and took a hand again, buying freely.

Consumers were forced into the mar-



AVERAGE MONTHLY SCRAP PRICES, 1914–1919. SHADED PORTION SHOWS PERIOD OF GOVERNMENT CONTROL

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Boston, Mass.—171 High St.
Buffalo, N. Y.—520 Marine Trust Bldg.
Philadelphia, Pa.—269 Drexel Bldg.
Pittsburgh, Pa.—59 Conestoga Bldg.
Rochester, N. Y.—133 Andrews St.
San Francisco, Cal.—320 Market St

ket in July for tonnage to meet their enlarged mill operations and heavy steel soon went to $20, the highest mark of the year to that time. Even at that price yard stocks were held off the market. Sales to consumers were from current offerings, which were not greater than demand. The apex for the year was reached at the beginning of August with heavy steel at $22 in some districts, and at this point much of the yard accumulations of the earlier months was moved.

Car Shortage Slowed Production

About this time the strike of railroad shop workers caused an artificial car shortage which slowed down the production of steel mills and demand fell off, with a corresponding recession of scrap prices. Then came the strike of steelworks employes, in September, which shut off all deliveries. For a time, steel scrap was difficult to move until the mills resumed gradually in October and demand was renewed. The price of heavy steel then went back to $20. By Nov. 1, mills were taking their normal tonnage and dealers were holding their steel for higher prices with the market around $20 to $21. At the end of the year the coal strike crippled mill operations and reduced demand for mill scrap by manufacturers of steel, bar iron and rerolled bars, giving the market the heaviest blow of the year. But repressed demand for mill products is known to be so great and the prospect for full mill operations when present difficulties are past, is so strong, that scrap has declined less than would be the case were consumption interrupted by other causes.

While the progress of heavy melting steel through the vicissitudes of the year may be taken as fairly representative of the list as a whole, there are some sharp exceptions in other grades which marked out a path of their own. Rerolling rails may be taken as an example. Railroads under the government's control have done a minimum of track replacement and thus have sold comparatively few rerolling rails. Even when the rerolling mills had little tonnage on their books it was difficult to obtain rails. This material relatively was high, at the end of the year reaching nearly to the level at which the government had fixed the price in 1918. At the middle of the year they were at $28 per gross ton, compared with $34 under the price fixing regime and were scarce. A little later they reached $32 to $33. Lack of soft steel bars during the steel strike turned heavy demand to makers of hard bars and increased the pressure for old rails. At the end of the year lack of fuel closed all such mills but scarcity of rails and heavy order books caused all offerings of this grade to be taken eagerly for stock and the quotation remained high.

Cast scrap presented an interesting situation, brought about by heavy demand from foundries to supplement their supplies of pig iron. Although no shortage of iron had developed up to the middle of the year, conditions seem to have been foreshadowed and in July sales were made at Chicago of No. 1 cast scrap at 75 cents per ton higher than the prevailing quotation on pig iron.

When the steel strike caused a lessened demand for steel scrap, it also stopped production of pig iron. The demand for cast grades to replace pig iron in the cupola thus was intensified and the price of this material advanced while other grades declined. At the same time an increased activity in bar iron which were being substituted for steel bars caused wrought scrap to take on new life. In November cast scrap sold generally about on an equality with the average price of pig iron. It came into strong demand as the pig iron situation became more congested.

Scrap Movement About Normal

Movement of scrap in general during the year was along normal channels for the most part, though to some extent unusual currents were set up by conditions not ordinarily met. The government sold accumulations of shell scrap at points where such material is not usually produced and this was disposed of by dealers to consumers at considerable distance in some instances. Government scrap in Canada, where shells were being made for the United States government, was shipped back into this country to escape the tariff duty levied on material imported. This was handled easily by American dealers. In New England the first slump early in the year carried heavy steel to $13 as it was supposed the government had large accumulations all over the country. This price was so attractive to Pittsburgh consumers that they bought round tonnages This gave New England dealers courage and they started buying on their own account, creating a dealers' market that continued throughout the year. Cast scrap started upward at the same time and at the beginning of December it was being quoted at $33.

Some unusual transactions were made during the year. One Cleveland dealer took more than 100,000 tons of billets from government accumulations and a Chicago dealer bought more than 140,000 tons of shell scrap. These were the largest single deals made in the process of disposing of the war material. That single firms are in a position to handle such large tonnages indicates that the scrap business is advancing rapidly and that it is able to take care of practically any situation that may arise.

Another exceptionally large transaction in government steel which had been left over after the readjustment of plans made during the war, was the purchase by a Chicago dealer of 300,000 tons of fabricated and unfabricated steel from the Emergency Fleet corporation. This represented the entire surplus of material of this character held by the Emergency Fleet corporation.

To the scrap trade it has been a year of large profits to those who judged aright and were not misled by surface indications. Ability of dealers to throw down and hold large tonnages through the depressed periods afforded comfortable profits. Selling of the war steel also gave quick gains for those able to handle the tonnages. While other branches of the steel industry met many disappointments and delays, the peculiar position of the scrap trade allowed it to avoid similar experiences and it has been a satisfactory period for those engaged in that line.

The average monthly prices on heavy melting steel at Pittsburgh, Chicago and eastern Pennsylvania during 1919 are as follows:

HEAVY MELTING STEEL

1919	Pittsburgh	Chicago	Eastern Pa.
January	$20.80	$19.20	$19.00
February	17.00	14.90	15.25
March	14.65	15.25	14.25
April	15.75	16.40	15.90
May	15.45	15.40	15.30
June	17.25	16.75	16.15
July	19.20	19.40	18.85
August	21.25	20.75	19.60
September	20.50	19.10	19.00
October	20.00	18.80	19.55
November	21.90	20.65	20.80
December	24.50	21.00	23.15

The average monthly prices on No. 1 railroad wrought at Pittsburgh, Chicago and eastern Pennsylvania during 1919 are as follows:

NO. 1 RAILROAD WROUGHT

1919	Pittsburgh	Chicago	Eastern Pa.
January	$27.50	$23.30	$29.80
February	20.50	16.65	25.00
March	17.50	17.65	24.00
April	18.50	18.50	21.50
May	18.50	17.05	21.90
June	18.75	18.70	22.50
July	20.40	21.20	24.70
August	22.90	23.25	27.25
September	23.50	21.25	27.00
October	22.90	22.00	27.00
November	24.75	26.50	27.85
December	26.15	26.65	30.75

The average monthly prices on No. 1 cast scrap at Pittsburgh, Chicago, and eastern Pennsylvania during 1919 are as follows:

NO. 1 CAST SCRAP

1919	Pittsburgh	Chicago	Eastern Pa.
January	$26.10	$26.25	$28.15
February	21.50	22.06	25.00
March	21.50	23.15	21.50
April	22.25	23.50	22.50
May	21.50	22.35	21.50
June	21.50	23.41	22.00
July	21.50	20.65	23.50
August	24.50	27.75	24.66
September	25.00	26.75	25.00
October	25.50	28.15	25.15
November	29.00	31.15	28.00
December	30.50	34.75	31.15

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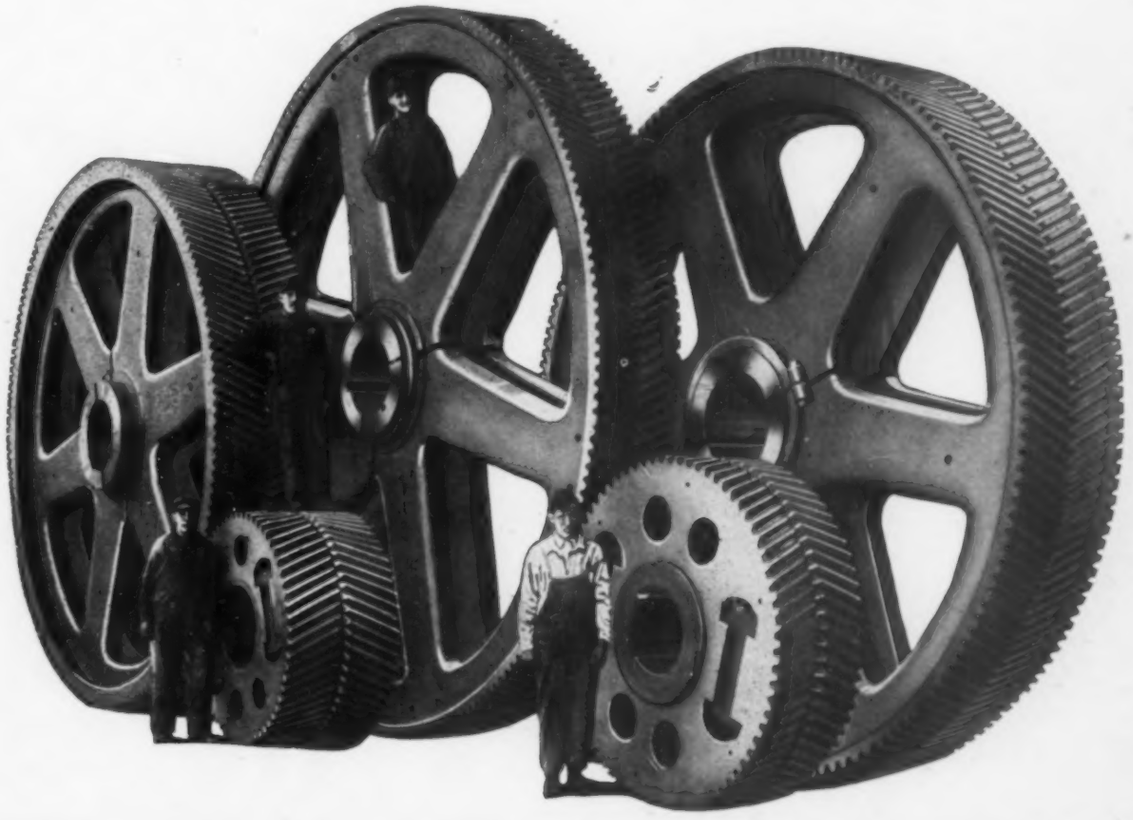


FALK HERRINGBONE GEARS

Strike Tightens Steel Shortage

Semifinished Material Rises $6.50 to $8 Per Ton in Final Quarter of Year—Loss in Ingot Output Because of Disturbed Operations Put at 40 Per Cent—Available Supplies Are Scant

CAN the market hold at $50 for sheet bars? Is there real basis for $45 for rerolling billets? Or for $65 for wire rods? The pig iron market answers all three questions in the affirmative and the scrap market joins the ayes. Basic iron today is $10 higher and the steel works scrap almost as much above the lowest point reached last year, considering the loss in shrinkage from materials changed is estimated at fully 12 per cent, the increase in sheet bars of $8, in rerolling 4 x 4 billets of $6.50, and the advance to $65 in wire rods appear reasonable especially in view of the higher labor costs.

Furthermore, the loss of ingot production during the unsettled labor conditions of the last quarter of the year must be reckoned with, as must also the fact that a tremendous amount of business in finished steel was piled up from the same cause, which cannot go forward with available supplies of semifinished steel. It may well be asked also that if so large a maker of semifinished material as the Carnegie Steel Co. had sufficient business, with the railroads of the country practically withdrawn from the market, to require practically its entire ingot capacity, as it did from late in the summer up to the outbreak of the strike in September, what is going to be its position and that of other producers of billets, sheet bars and other forms of semifinished steel, as respects the open market when the railroads re-enter the market as they are likely to this year?

Opinion as to the future course of the market, however, is not all ranged on one side of the question. Since the ingot-making capacity of the country is approximately 50,000,000 tons annually, it may be and indeed, is argued that a scarcity is impossible. Not only the United States Steel Corp., but practically all of the larger independent companies, now are self-contained. In other words, they do not have to depend upon the open market for raw materials and their costs of the latter hence are much lower than buying and selling quotations.

Opponents of higher prices also have the backing of the Steel corporation, which, several of the independent manufacturers, continues to hold to the March 21 price on finished material and is making no attempt to secure higher values for the partly finished steel. It must be admitted that the sales of semifinished material which have taken place at the highest prices quoted have involved a small tonnage in comparison with the whole and that they usually have represented an emergency or a temporary demand.

In the consideration of future requirements as shown by the figures of unfilled or backed up tonnages, too little thought sometimes is given to the absorptive powers of consumers. If the business now before the steel industry had to be completed within a specified time, or buyers in some fashion could absorb supplies at a faster rate than formerly, there simply would be no stopping of sharply higher prices. Perhaps the biggest prospective business not yet booked is with the railroads of the country. It has been estimated that 4,000,000 tons of rails are required, but while that tonnage could be produced in a comparatively short time, it would take the railroads a much longer period to absorb it. Annual requirements of any industry no matter how large or small usually mean shipments over 12 and not a few months.

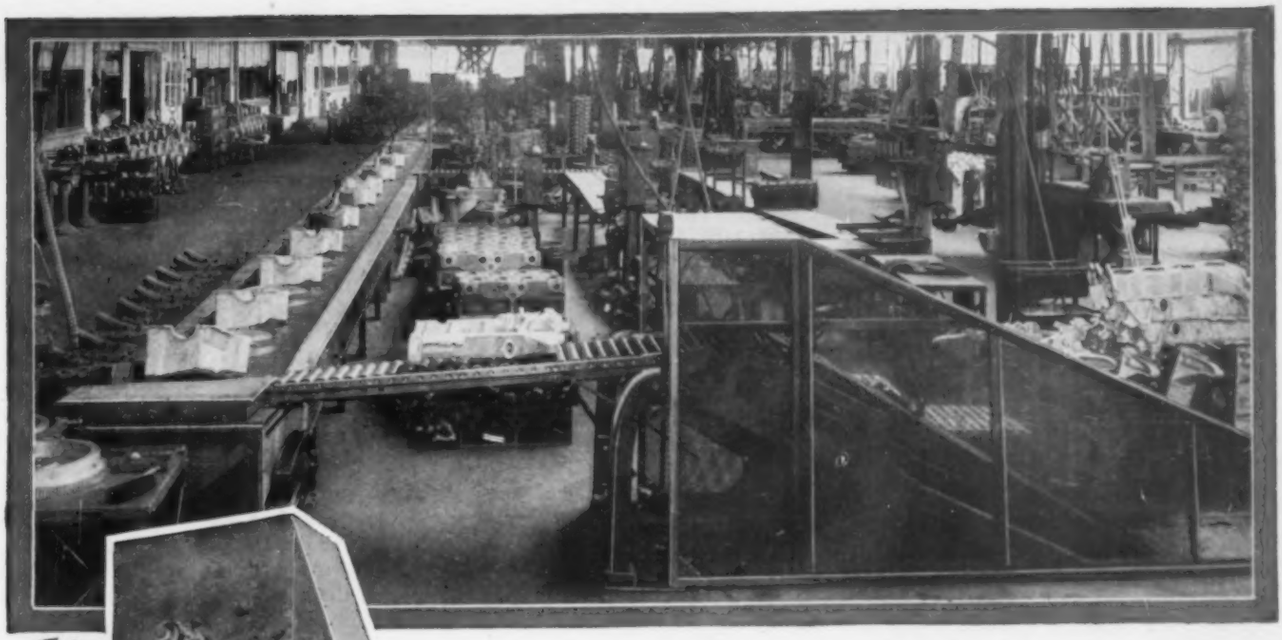
Loss of Steel Indefinite

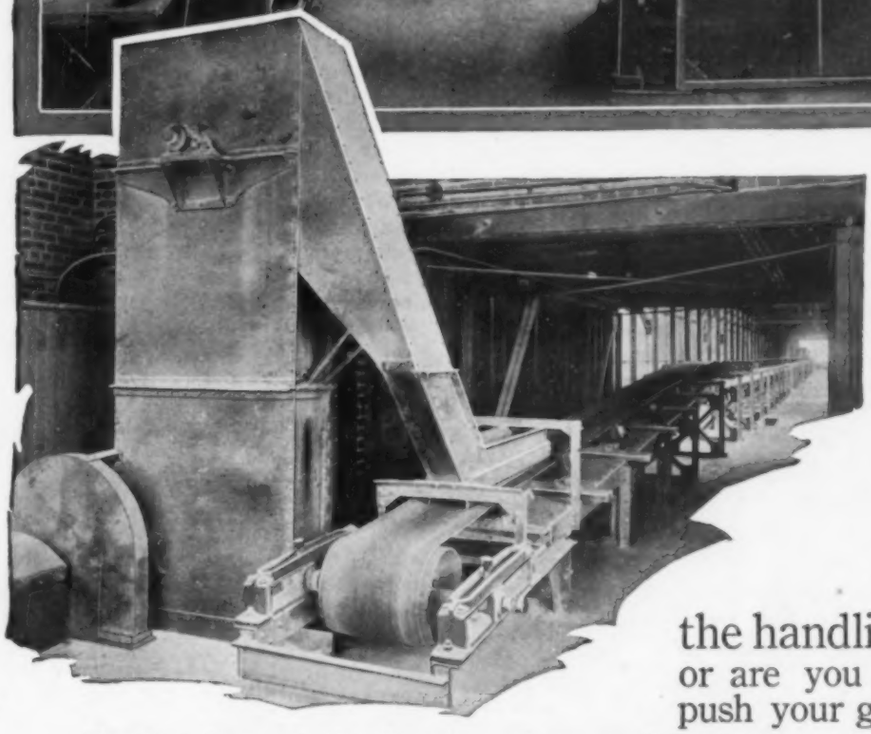
What the loss of ingot production actually was in the last quarter of the year just closed is a matter of hazy guesswork. It has been argued by some that since the heaviest requirements of steel consumers had been met before the strike occurred, that the final quarter of the year would have seen some decline in the output of ingots. Such a claim, however, find little support in the fact that the demand for almost every kind of finished steel was sufficient not only to absorb production, such as it was during this period, but also to reduce warehouse supplies to almost nothing. In the period, it is doubtful if active ingot-making capacity averaged higher than 65 per cent and the loss in tonnage easily was 40 per cent, making due allowance for the inefficiency of the working forces, for various reasons. Since the capacity is available, the making up of this loss resolves itself into a question of labor. It is pretty generally agreed that the supply of labor is deficient as to numbers compared with what it was a few years back, but labor-saving machinery has compensated in part for this loss.

Up to the time of the development of the labor troubles, there were few times when the nonintegrated steel manufacturers had any difficulty in securing ample supplies of semifinished steel. Some shortage of open hearth sheet bars was observed early in the year, but it was short-lived and was not felt by all consumers. Failure of much business to develop in plates until late in the year kept the demand for slabs at a minimum and they were never hard to find until the strike interfered with production. Pipe makers had a busy year and this fact not only kept skelp closely sold up, but also helped the market in slabs to the extent that considerable tonnages of plates were used in the making of large pipe. Rod makers never had a surplus after the wire business began to improve, although no real scarcity developed except during the strike, for the wire business did not get going until about the middle of the year and then it was hard to keep finishing mill operations equal to the rod production. More rod making than finishing capacity was in operation with the ending of the steel plant strike. There seemed however to be an outlet for all the rods available. Comparatively few of the finishing mills suffered badly for billets even during the steel plant strike. Those who did, entered the market for needed tonnages and largely on this demand was the advance from the March 21 prices based.

Manufacturers had a pretty constant flow of export inquiries throughout the year for various kinds of semifinished steel, but the figures of exports indicate that the actual business was considerably out of line with the inquiries. Government figures for the 10 months ended Oct. 31, the latest figures available, show exports of semifinished steel to have been only 224,158 tons, or at an annual rate of 268,992 tons, which contrasts feebly with the record for the three previous years, 1918 showing exports of 1,792,794 tons, 1917 of 2,018,357 tons and 1916 of 1,504,563 tons, which however were abnormal and represented war steel demands.

A horizontal cut of $4 per ton was made in all kinds of semifinished material, except wire rods, effective Jan. 1, 1919, at the final meeting of the war industries board and the price committee of the American Iron and Steel institute in December, 1918. Rerolling billets went to $43.50, slabs to $46, sheet bars to $47, while rods held to the price of the final quarter of 1918, or





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$57. The Jan. 1 prices on skelp were 2.70c for grooved, 2.95c for universal and 3.05c for sheared. These prices held until March 21, when a cut of $5 per ton was made in all classes of semifinished, this time including wire rods. This was the contribution of the steel industry to the attempt of the government through the industrial trade board to hasten the restoration of normal industrial activity. The market was not well maintained at these figures save possibly on sheet bars during the summer, but it strengthened as a result of the strike curtailment of production and the feverish, though relatively small demands of those whose regular supplies were cut off for a time. The result was the steep advance of the market. When the year ended, sheet bars were at $50 and 4 x 4-inch rerolling billets at $45 and wire rods at $65. All forms were in scant supply.

While tendency is noted on the part of the producers of semifinished steel to enlarge their finishing departments and thus have less of the former tonnage to offer, it must be said that the middleman, crowded out of the semifinished steel business during the war came back into his own to a considerable extent during the strike period, when those who could not secure material directly from producers appealed to him to find supplies for them. The latter usually succeeded, and was repaid for his trouble.

Demand For Coal By-Products Expands

THAT present day requirements of benzol, toluol and solvent naphtha are the greatest in the history of the coking industry has been clearly brought out by developments of the past year. During that time demand increased until it exceeded the rate prevailing during the war, absorbing the heavy accumulations on hand at the beginning of the year and booking up production months in advance. Even though there had not been the curtailment of coke production in the last quarter as the result of the steel strike and coal situation, the output of these derivatives would still have been insufficient to meet the demand. The established usage of these distillates for fuel purposes and the consistent increase in their usage for chemical and solvent purposes have been the outstanding factors in the improved activity of the market.

At the beginning of the year few foresaw such developments; in fact, the outlook was none too encouraging. For the six months or so preceding the signing of the armistice, the government had been by far the largest consumer of these products. Benzol was used for conversion into phenol and thence into picric acid; toluol for trinitrotoluol and solvent naphtha for its xylol content into trinitroxylol. Practically 100 per cent of the production of toluol and solvent naphtha was required for explosive purposes. Benzol, although not commandeered as were the other two products, was at the same time, purchased in tremendous quantities, and the picric acid program of the government required by far the largest part of the country's output.

With the signing of the armistice this demand was completely removed. At the same time large quantities of benzol, toluol and solvent naphtha already accumulated by the government at its various explosive plants were available for other uses. The prevailing peace markets for these distillates were insufficient to take care of the tremendous increase in supply available by the first of the year, and consequently, there was more or less apprehension among sellers over developments of the early months to follow. Furthermore, it was a generally conceded fact that the dyestuff manufacturers had substantial supplies on hand, and that this, in conjunction with their decreased operations, following the cessation of hostilities, would not make for any large buying by the dyestuff industry for some months to come.

This was precisely what developed, for during the first half there was little or no buying by these interests, and production, at the same time, continued at approximately the same rate as before the armistice, the output being dependent upon the operations of the coke ovens rather than upon any demand for the by-products themselves. However, a source of outlet for a substantial quantity of these distillates was the motor fuel industry. While this industry for some time since had been a heavy consumers of light oil distillates abroad, it had never previously figured to any extent in the coal tar products market in this country.

About the middle of the year, the dyestuff manufacturers entered the market and demand increased steadily, absorbing all accumulations and stiffening the market in the last half perceptibly. It is estimated that, based on normal production, more than 50 per cent of the country's output will be required in 1920 for chemical and solvent purposes outside the motor fuel industry.

Phenol during the past year has not been produced in any sizable quantities, the government's large accumulations being sufficient to take care of the country's needs for some time to come. Late in August the government arranged with the Monsanto Chemical Works to dispose of 27,000,000 pounds of phenol for a series of years at a fixed price of 12 cents, f.o.b. government storehouses.

Napthalene, which is a relatively small quantity by-product of the coke ovens, was not in sufficient demand during the first half of the year to justify its full recovery. This situation changed radically in the last four months, due primarily to the dyestuff requirement of naphthalene. That requirement today exceeds available supplies, and a conservative estimate would show that for 1920 there will be a dyestuff requirement alone for naphthalene fully equal to the maximum production of this by-product during the period of war.

Demand for sulphate of ammonia was exceedingly dull during the first six months. This is attributable to the fact that the fertilizer interests, which usually are heavy buyers in the winter and spring, delayed purchasing until after the first half, owing to heavy accumulations of scrap ammoniates on hand when the armistice was signed. This dullness, in conjunction with a steady production of coke throughout the first six months, resulted in a large volume of supplies at the beginning of the second half. However, as the fertilizer interests came into the market these stocks diminished during the last quarter.

Car Tar Products Prices in 1919

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Benzol	$0.245	$0.225	$0.225	$0.245	$0.245	$0.255	$0.26	$0.265	$0.27	$0.27	$0.27	$0.27
Toluol	.30	.30	.30	.30	.30	.30	.30	.30	.28	.28	.28	.28
Solvent naphtha	.225	.225	.225	.225	.225	.235	.245	.245	.245	.245	.245	.245
Phenol	.10	.10	.10	.10	.10	.10	.11	.12	.12	.12	.12	.12
Naphthalene, flakes	.10	.09	.09	.09	.09	.09	.08	.07	.07	.07	.07	.07
Naphthalene, balls	.13	.11	.11	.11	.11	.11	.10	.08	.08	.08	.08	.08
Sulphate of ammonia, spot	4.68	4.50	4.25	4.00	3.80	3.60	3.40	3.53	3.53	3.57	3.78	3.93
Sulphate of ammonia, futures	4.58	4.40	4.10	3.90	3.70	3.50	3.20	3.33	3.33	3.38	3.53	3.55

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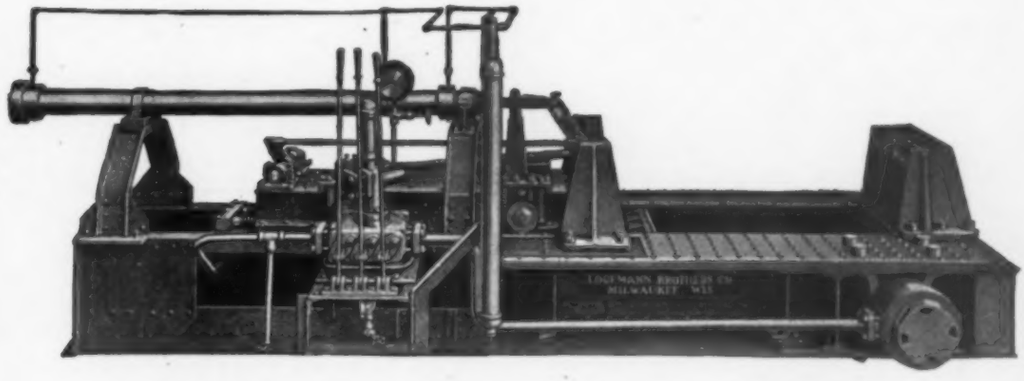

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Average Monthly Prices of Leading Iron and Steel Products, 1908-1919

Finished Products in Net Tons. Pig Iron and Billets in Gross Tons.

	1919											
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
No. 2 Foundry Chicago	$31.00	31.00	29.95	26.75	26.75	26.75	26.75	26.75	26.75	27.55	31.75	38.30
Plates Chicago	$65.40	65.40	63.00	58.40	58.40	58.40	58.40	58.40	58.40	58.40	58.40	58.40
Billets (Bess.) Pittsburgh	$43.50	43.50	42.25	38.50	38.50	38.00	7.30	38.50	38.50	39.30	40.90	45.75
Bessemer Pig Pittsburgh	$33.60	33.60	32.55	29.35	29.35	29.35	29.35	29.35	29.35	29.35	32.00	36.15
Basic Pig Pittsburgh	$31.40	31.40	30.35	27.15	27.15	27.15	27.15	27.15	27.15	27.15	30.40	34.50
Beams Pittsburgh	$56.00	56.00	54.20	49.00	49.00	49.00	49.00	49.00	49.00	49.00	49.00	49.00
Bar Iron Cleveland	$66.40	65.00	63.20	53.14	50.40	50.40	50.40	50.40	55.00	60.00	60.00	65.00
Steel Bars Pittsburgh	$54.00	54.00	52.20	47.00	47.00	47.00	47.00	47.00	47.00	49.00	50.00	
No. 2 Foundry Birmingham	$31.00	31.00	30.00	26.75	26.25	25.25	25.00	26.75	26.75	27.45	30.65	35.00

	1918											
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
No. 2 Foundry Chicago	$33.00	33.00	33.00	33.00	33.00	33.00	33.00	33.00	33.00	34.00	34.00	34.00
Plates Chicago	$65.00	65.00	65.00	65.00	65.00	65.00	70.00	70.00	70.00	70.00	70.00	70.00
Billets (Bess.) Pittsburgh	$47.50	47.50	47.50	47.50	47.50	47.50	47.50	47.50	47.50	47.50	47.50	47.50
Bessemer Pig Pittsburgh	$37.25	37.25	37.25	36.15	36.15	36.15	36.15	36.40	36.60	36.60	36.60	36.60
Basic Pig Pittsburgh	$33.95	33.95	33.95	32.95	32.95	32.95	33.20	33.40	33.40	33.40	34.40	34.40
Beams Pittsburgh	$60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00
Bar Iron Cleveland	$72.80	72.80	72.80	72.80	72.80	72.80	72.80	72.80	72.80	72.80	72.80	72.80
Steel Bars Pittsburgh	$58.00	58.00	58.00	58.00	58.00	58.00	58.00	58.00	58.00	58.00	58.00	58.00
No. 2 Foundry Birmingham	$34.50	33.50	33.50	33.50	33.50	33.50	33.50	33.50	33.50	33.50	35.25	35.25

	1917											
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
No. 2 Foundry Chicago	$30.00	31.25	35.70	39.25	43.20	51.00	55.00	55.00	49.50	43.00	43.00	43.00
Plates Chicago	$79.60	78.80	91.80	93.80	109.80	158.40	192.80	192.00	146.60	65.00	65.00	65.00
Billets (Bess.) Pittsburgh	$60.00	62.50	67.00	72.50	85.00	93.75	100.00	93.00	73.75	58.75	47.50	47.50
Bessemer Pig Pittsburgh	$35.95	35.95	37.45	42.20	44.95	55.20	57.95	55.55	48.27	37.25	37.25	37.25
Basic Pig, Pittsburgh	$30.95	30.95	32.85	39.20	42.15	50.20	53.20	52.25	43.95	33.95	33.95	33.95
Beams Pittsburgh	$61.50	65.00	69.20	74.00	80.00	80.00	90.00	90.00	75.00	60.00	60.00	60.00
Bar Iron Cleveland	$60.00	60.00	60.00	65.00	65.00	70.00	90.00	95.00	90.00	90.00	78.80	73.00
Steel Bars, Pittsburgh	$59.40	60.00	64.20	67.80	70.00	72.40	77.00	80.00	74.40	58.00	58.00	58.00
No. 2 Foundry Birmingham	$23.00	24.50	28.00	35.80	35.75	35.75	46.00	48.00	43.50	33.50	33.50	33.50

	1916											
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
No. 2 Foundry Chicago	$18.50	18.50	18.70	19.00	19.00	19.00	19.00	19.00	18.65	19.15	25.00	29.25
Plates Chicago	$41.00	47.00	55.00	59.00	62.00	62.00	62.00	63.00	64.00	64.00	69.20	75.00
Billets (Bess.) Pittsburgh	$33.75	34.00	40.60	45.00	44.25	41.20	40.00	43.60	45.00	45.75	52.00	58.75
Bessemer Pig Pittsburgh	$21.32	21.45	21.55	21.95	21.95	21.95	21.95	21.95	22.20	24.33	30.35	35.95
Basic Pig, Pittsburgh	$19.20	18.77	19.20	19.20	18.95	18.95	18.95	18.95	19.05	20.82	25.95	30.95
Beams Pittsburgh	$37.20	40.60	48.00	50.00	50.00	50.00	50.00	50.00	52.00	54.00	57.60	60.50
Bar Iron Cleveland	$40.00	45.80	48.00	48.00	48.00	48.00	48.00	48.00	48.00	51.00	54.00	60.00
Steel Bars, Pittsburgh	$37.20	40.20	46.80	50.00	50.00	50.00	50.00	50.00	52.00	52.00	55.60	58.50
No. 2 Foundry Birmingham	$14.50	14.63	15.00	15.00	15.00	14.45	14.00	13.60	14.38	15.13	19.60	23.00

	1915											
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
No. 2 Foundry Chicago	$13.00	13.00	13.00	13.00	13.00	13.00	13.00	13.38	13.80	14.44	17.12	18.00
Gray Forge Cincinnati	$25.60	25.40	26.80	25.60	25.80	26.20	27.80	28.80	29.80	31.10	35.80	39.40
Plates Chicago	$19.50	19.50	19.50	19.50	19.87	21.40	23.00	24.60	25.50	27.75	29.60	
Billets (Bess.) Pittsburgh	$14.70	14.65	14.55	14.55	14.55	14.58	14.88	15.89	16.80	16.95	17.45	19.85
Bessemer Pig Pittsburgh	$13.42	14.01	13.96	13.90	13.90	13.90	13.90	13.90	13.75	13.45	13.45	13.45
Beams Pittsburgh	$22.00	22.00	23.00	23.00	24.00	24.00	25.00	26.00	26.80	28.10	32.50	36.00
Bar Iron Cleveland	$23.00	23.00	24.00	24.40	24.00	24.00	24.00	24.50	26.20	27.75	30.00	35.00
Steel Bars, Pittsburgh	$22.00	22.00	23.00	24.00	24.00	24.00	25.20	26.00	26.80	28.20	32.50	34.80
No. 2 Foundry Birmingham	$9.50	9.50	9.38	9.35	9.75	9.50	9.60	11.00	11.30	11.75	13.12	14.20

	1914											
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
No. 2 Foundry Chicago	$14.25	14.19	14.25	14.25	14.25	14.19	14.00	14.00	13.65	13.30	13.00	13.00
Gray Forge Cincinnati	$12.75	12.75	12.87	12.75	12.75	12.69	12.30	12.25	12.25	12.25	11.90	11.40
Plates Chicago	$26.60	27.35	27.60	26.30	25.80	25.60	25.60	27.35	27.35	26.00	25.00	24.00
Billets (Bess.) Pittsburgh	$20.00	20.75	21.00	20.80	20.00	19.75	19.30	20.00	21.00	20.60	19.00	18.50
Bessemer Pig Pittsburgh	$15.00	15.09	15.15	14.90	14.90	14.90	14.90	14.90	14.90	14.85	14.70	14.70
Beams Pittsburgh	$24.00	24.00	24.00	23.60	23.00	22.38	22.20	23.50	24.00	23.50	22.20	21.00
Bar Iron Cleveland	$26.00	26.00	24.75	24.60	24.00	24.00	24.00	24.00	24.00	24.00	23.75	23.00
No. 2 Foundry Birmingham	$10.50	10.50	10.60	10.50	10.50	10.50	10.44	10.05	10.00	10.00	10.00	9.88	9.50

	1913											
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
No. 2 Foundry Chicago	$18.00	18.00	17.62	17.25	16.70	16.12	15.20	15.00	15.00	15.00	15.00	14.50
Gray Forge Cincinnati	$15.75	15.25	15.25	14.25	13.50	12.75	12.75	12.75	13.25	13.25	13.00	13.25
Plates Chicago	$33.60	33.60	33.60	33.60	32.80	32.60	32.60	31.60	30.80	28.85	27.60	
Billets (Bess.) Pittsburgh	$28.20	28.87	29.00	29.00	27.37	26.50	26.50	26.12	25.00	23.00	20.87	20.00
Bessemer Pig Pittsburgh	$18.15	18.15	18.15	17.92	17.90	17.26	16.65	16.52	16.65	16.60	16.00	15.90
Beams Pittsburgh	$29.00	29.00	29.00	29.00	29.00	29.00	29.00	29.00	28.25	27.40	26.00	25.00
Bar Iron Cleveland	$33.00	33.00	33.00	33.00	32.50	32.00	31.20	29.25	28.25	27.40	27.00	26.00
No. 2 Foundry Birmingham	$13.70	13.50	13.00	12.50	11.75	10.60	10.50	11.00	11.00	11.00	10.75	11.00

	1912											
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
No. 2 Foundry Chicago	$14.00	14.00	14.00	14.25	14.50	14.50	14.62	15.30	16.37	17.30	17.87	18.00
Gray Forge Cincinnati	$12.50	12.50	12.50	12.50	12.85	13.00	13.50	13.90	14.75	15.70	16.18	15.75
Plates Chicago	$26.00	25.70	25.90	27.55	28.60	28.60	29.60	30.40	31.35	32.60	33.60	33.60
Billets (Bess.) Pittsburgh	$20.00	20.00	19.85	20.00	21.10	21.85	22.25	22.40	23.75	25.70	26.75	27.00
Bessemer Pig Pittsburgh	$15.15	15.00	15.02	15.15	15.15	15.15	15.15	15.43	15.93	17.75	18.05	18.15
Beams Pittsburgh	$23.00	23.00	23.00	23.40	25.00	25.00	26.00	27.40	28.60	28.60	29.00	29.00
Bar Iron Cleveland	$24.00	23.50	23.50	24.00	24.40	25.25	27.00	27.25	29.00	30.20	31.00	31.00
No. 2 Foundry Birmingham	$10.00	10.00	10.00	10.50	10.95	11.00	11.25	11.65	12.50	13.45	13.75	13.50

	1911											
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
No. 2 Foundry Chicago	$15.00	15.00	15.00	15.00	15.00	15.00	15.00	14.50	14.50	14.50	14.00	14.00
Gray Forge Cincinnati	$13.35	13.25	13.15	13.05	12.90	12.50	12.05	12.05	12.05	12.00	12.00	12.00
Plates Chicago	$31.60	31.60	31.60	30.60	30.60	30.60	30.60	29.60	29.60	26.60	25.00	25.00
Billets (Bess.) Pittsburgh	$23.00	23.00	23.00	23.00	23.00	21.00	21.00	21.00	21.00	20.00	19.70	19.25
Bessemer Pig Pittsburgh	$15.90	15.90	15.90	15.90	15.90	15.90	15.90	15.90	15.90	15.30	15.10	15.15
Beams Pittsburgh	$28.00	28.00	28.00	28.00	28.00	27.00	27.00	27.00	26.40	24.00	22.60	23.25
Bar Iron Cleveland	$27.00	27.00	27.00	26.75	26.20	24.75	24.00	25.00	24.75	24.00	24.00	24.00
No. 2 Foundry Birmingham	$11.00	11.00	11.00	11.00	10.75	10.25	10.00	10.05	10.10	10.00	9.75	10.00

	1910											
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
No. 2 Foundry Chicago	$19.00	18.75	18.25	17.00	16.75	16.50	16.50	16.50	16.50	16.00	16.00	16.00
Gray Forge Cincinnati	$16.50	16.38	15.75	14.88	14.50	14.35	14.12	13.75	13.75	13.75	13.75	13.75
Plates Chicago	$35.60	35.60	34.60	33.60	33.60	32.60	31.60	31.60	31.60	31.60	30.60	30.60
Billets (Bess.) Pittsburgh	$27.87	27.50	27.50	27.00	26.12	25.50	25.00	25.00	24.50	23.38	23.00	23.00
Bessemer Pig Pittsburgh	$19.90	19.42	18.90	18.15	17.09	16.73	16.40	16.21	15.90	15.90	15.90	15.90
Beams Pittsburgh	$31.00	31.00	30.40	30.00	30.00	29.20	28.20	28.00	28.00	28.00	28.00	28.00
Bar Iron Cleveland	$33.00	33.00	33.00	32.50	31.00	30.10	29.00	28.00	28.00	28.00	27.80	27.00
No. 2 Foundry Birmingham	$14.00	13.88	13.00	12.12	11.81	11.60	11.38	11.00	11.00	11.00	11.00	11.00

	1909											
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
No. 2 Foundry Chicago	$17.44	16.75	16.50	16.46	16.21	16.41	16.90	17.37	18.20	18.87	19.00	19.00
Gray Forge Cincinnati	$14.75	14.62	13.50	13.25	13.31	13.50	13.95	14.62	15.25	16.62	16.75	16.75
Plates Chicago	$35.60	34.10	29.60	28.60	28.95	28.60	30.60	31.60	32.80	33.60	35.60	35.60
Billets (Bess.) Pittsburgh	$25.00	23.50	23.00	22.00	22.50	23.00	24.00	25.00	26.00	26.50	27.50	27.50
Bessemer Pig Pittsburgh	$17.34	16.78	16.34	15.80	15.48	16.13	16.37	17.13	18.32	19.68	19.90	19.90
Beams Pittsburgh	$32.00	29.00	26.00	24.00	25.00	26.00	27.00	28.00	30.00	31.00	32.00	
Bar Iron Cleveland	$29.00	28.75	26.20	25.25	25.00	26.20	29.25	30.00	30.00	30.00	32.00	32.00
No. 2 Foundry Birmingham	$13.00	12.70	11.75	11.00	11.00	11.31	12.30	13.00	14.00	14.50	14.50	14.00

	1908											
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
No. 2 Foundry Chicago	$18.24	17.87	17.42	17.21	17.00	17.31	17.00	17.00	16.75	16.50	16.75	17.35
Gray Forge Cincinnati	$14.45	14.06	13.63	13.60	13.50	13.75	13.70	14.00	14.25	14.25	14.25	14.75
Plates Chicago	$37.60	37.60	37.60	37.60	36.60	35.60	35.60	35.60	35.60	35.60	35.60	35.60
Billets (Bess.) Pittsburgh	$28.00	28.00	28.00	28.00	28.00	26.50	25.00	25.00	25.00	25.00	25.00	25.00
Bessemer Pig Pittsburgh	$19.00	17.90	17.80	17.49	16.92	16.90	16.73	16.11	15.90	15.48	16.74	17.40
Beams Pittsburgh	$34.00	34.00	34.00	34.00	34.00	33.00	32.00	32.00	32.00	32.00	32.00	32.00
Bar Iron Cleveland	$28.80	27.00	28.00	28.40	30.00	29.00	29.00	29.00	29.00	29.00	29.00	29.00
No. 2 Foundry Birmingham	$12.80	12.50	12.12	11.90	11.50	12.00	11.60	12.06	12.50	12.50	12.50	13.00

Charts based on above prices are published as a supplement of today's issue.